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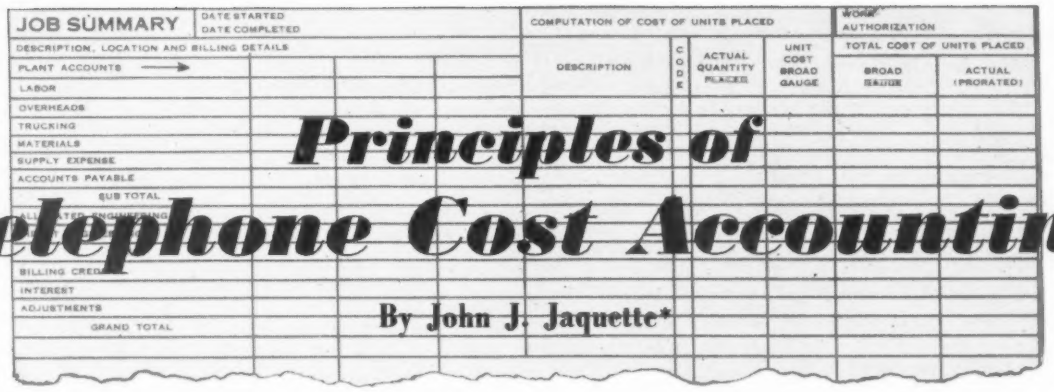

Principles of Telephone Cost Accounting

By John J. Jaquette*

EACH DAY of the year, we Americans make over 185,000,000 telephone calls and every one of these conversations requires the interconnection of two or more of the nation's 50 million telephones. It would be interesting if we could select one of these millions of conversations and bring it into the laboratory for analysis.

What did it cost? What is its value? The human mind has not yet devised a scale or a means of measuring the value of a telephone conversation. A proposal of marriage, an emergency call to the fire department or news of the death of a friend—there is no measuring the value of telephone service. Accountants *can* measure with reasonable accuracy the total cost of all conversations, though the allocation of these costs to the many thousands of items in a company's tariff or price list would be almost impossible and of only academic interest.

Why, then, do we have cost accountants on the telephone company's payroll? Utility management is vitally concerned with cost accounting because of its bearing on the valuation of fixed assets. Fixed asset costs, through depreciation, loom large in determining the total economic cost of providing telephone service. (They constitute more than ⅓ of total operating expenses of the Hawaiian Telephone Company.) Proper accounting for the costs of fixed assets is also a concern to all telephone subscribers through public utilities commissions. These costs are used to determine the rate base upon which a fair return may be earned and, hence, to establish the general level of rates or charges. The writer has the hope that a description of telephone cost accounting will be of interest and value to non-accounting people in the telephone business.

Classification Of Fixed Assets

Classification of Telephone Plant. The fixed assets dedicated to public service in the telephone business are classified to 21 different accounts established by the Federal Communications Commission (FCC). Studies of service lives and adequacy of depreciation reserves are made by these classifications, and appropriate group depreciation rates for each of the many types of plant are used in calculating our depreciation expense.

Units of Telephone Plant. The costs of telephone plant must be determined by units which are also prescribed by the FCC. Many of these units are familiar to the public such as the telephone instrument, a span of cable, the pole, its cross-arms, the telephone company's central office building, and the private branch exchange. Other units are known only to the telephone family such as the following complex units of central office equipment:

Main distributing frames.

Power equipment.

Telephone repeater equipment.

Carrier equipment.

Type of Authorization	*Approval Authority*
Estimate	Executive Management
Job Order	Chief Eng.
Routine Order	Supervising Eng.
Service Order	Sales Mgr.

Line Filter.

Pulse machine equipment.

Also, in the latter group are the local automatic power plants used to serve a small dial or a small multiple private branch exchange.

The development of proper unit costs is important for retirement of plant withdrawn from telephone plant. The expansion of telephone facilities is not simply a matter of adding to existing facilities. Some retirements of old units are almost always involved in the construction of new plant. There is also a great deal of replacement work required by highway relocation projects.

Authorization Of Work

Construction work must be authorized by management. In large companies, particularly, standard construction or installation of equipment is authorized by means of service orders issued by the commercial department which department includes the sales or service engineering section. Larger construction projects and those which are non-routine in nature are authorized by the engineering department or by executive management according to the expenditure involved. In all cases, however, an order number or job number is assigned. In the Hawaiian Telephone Co., for example, the following table shows the types of jobs and the cost accounting as well as the authorization procedures:

Monetary Limit	*Job Costs Accumulated*
$5,000 and over	Yes
$2,000—$4,999	Yes
Up to $2,000	When Requested
Usually less than $1,000	When Requested

Most jobs involve several plant classifications and each of these classifications involve many different units.

Cost Elements In Construction

Engineering. Preliminary engineering and studies are conducted before actual construction work is authorized. The costs of this work are accumulated in "projects" which are numbered for

*Mr. Jaquette is chief accountant of the Hawaiian Telephone Co. of Honolulu.

CONSOLIDATED JOURNAL VOUCHER

ACCOUNT NUMBER	DEBIT TOTALS	SUB TOTALS	CONTROL ACCOUNT TOTALS	MATERIALS AND SUPPLIES 122	SUPPLY EXPENSE 704	PURCHASED MATERIALS AND SERVICES 159.2-01 & 02	PAYROLL 159.2-03	PLANT LABOR 716	GENERAL PLANT SUPERVISION 706	TOOL EXPENSE 702.2	LOCAL PLANT ADMIN. 711	VEHICLE EXPENSE 702.1	ENGINEERING EXPENSE 705	HOUSE SERVICE EXPENSE 707

Fig. 1

accounting convenience and for control. After the work has been authorized, the project costs are transferred to the job; subsequent engineering costs are charged directly to the job. In the event a project is abandoned or actual construction work is indefinitely postponed, the costs accumulated in the project are charged off to expense or in some special cases to surplus.

Engineering costs are distributed on the basis of daily time reports prepared by the engineers covering time spent on the various projects and jobs. A loaded rate is used to distribute all of the costs of maintaining the engineering department over the reported hours. The rate, therefore, includes salaries (both productive and non-productive), rents, supplies, vehicle expense, janitorial service and engineering department overhead.

Labor. Telephone construction work is a specialized field requiring specialized and skilled labor groups. Construction gangs handle the placement of poles and the stringing of wire or cable; cable splicers and helpers make the hundreds of thousands of connections required for the distribution system; equipment installers handle the work of setting up the central office equipment, etc. (In the Hawaiian Telephone Co. we have 15 separate labor groups.)

Daily time reports are prepared for these groups showing the number of hours chargeable to each of the various accounts and jobs. Average hourly rates are established monthly for each of these labor groups by summarizing the payroll for the group (including that of the first line supervisor) and dividing by the total non-supervisory productive hours. The accounting department records those productive man hours by job and code and uses the average rate to evaluate the labor cost.

The use of the average group hourly rate makes for considerable economy in cost accounting work. While it sacrifices some degree of precision as to the actual money paid to the specific men who erected a particular group of poles, the method does provide for the distribution of all labor costs in an equitable manner. The following example indicates briefly how this average rate works in the Hawaiian Telephone Co.:

Men	Pay Rate	Distribution of Time				
		Job 1234	Job 4321	Vacation	Training Classes	Total
Supervisor A.	$375 Mo.	80	80	8		168
Man B.	$1.75 Hr.	94	6	68		168
Man C.	$1.50 Hr.	168				168
Man D.	$1.75 Hr.	40	100			140
Man E.	$1.25 Hr.		168			168
Man F.	$1.10 Hr.	88			80	168
Reported hours— Non Supervisory		390*	274*	68	80	812

*Productive hours

Total labor costs are $1,560.80 ($375 for the first line supervisor and $1,185.80 for 812 paid hours for men B through F). This gives a rate of $2.3506 per hour for the group which is applied to the productive hours to give $916.74 charge to job 1234 and $644.06 to be charged to job 4321. It is not necessary to prorate supervision, vacation or training time to the two jobs nor is it necessary to make separate summaries and evaluations for each man.

Material Costs. Materials are charged to accounts and jobs by the supply department. Tickets are prepared for each disbursement and forwarded to inventory control for posting to perpetual inventory cards and for pricing. Tickets are then forwarded to the plant accounting unit for extension and summarization to the proper accounts and proper jobs.

Vehicle or Trucking Costs. Vehicles used in the telephone business are of many types. For accounting simplicity, however, we have made four groupings which are used in computing average rates, as follows:

Light Vehicles (including passenger cars).

Heavy vehicles.

Special vehicles, self propelled (including compressors, etc.).

Special vehicles (trailers).

Vehicle expense is distributed on the basis of hours of use rather than miles traveled. This is considered to be the most equitable basis for charges since the vehicles are primarily traveling tool rooms and store-houses and are necessarily tied up at the work site for long periods without going very many miles. The hours of vehicle use are reported separately on the same forms used by construction men to record the distribution of their labor hours.

Contractor Services and Direct Purchases. The Hawaiian Telephone Co. has found it economical to contract

WORK IN PROGRESS LEDGER SHEET

DESCRIPTION

LOCATION REMARKS

CONSTRUCTION SCHEDULE

PARTIAL CLEARANCE

ESTIMATE OR JOB NUMBER

ESTIMATED COST START CLOSE

CODE	MONTH	PERCENT	CODE	MONTH	PERCENT

	PAYROLL	OVERHEADS	VEHICLE	M&S	SUPPLY EXPENSE	ENGINEERING	ACCOUNTS PAYABLE	INTEREST	DATE	REF	TOTALS	BALANCE

Fig. 2

JOB SUMMARY	DATE STARTED / DATE COMPLETED			COMPUTATION OF COST OF UNITS PLACED				WORK AUTHORIZATION	
DESCRIPTION. LOCATION AND BILLING DETAILS				DESCRIPTION	CODE	ACTUAL QUANTITY PLACED	UNIT COST BROAD GAUGE	TOTAL COST OF UNITS PLACED	
PLANT ACCOUNTS →								BROAD GAUGE	ACTUAL (PRORATED)
LABOR									
OVERHEADS									
TRUCKING									
MATERIALS									
SUPPLY EXPENSE									
ACCOUNTS PAYABLE									
SUB TOTAL									
ALLOCATED ENGINEERING									
DIRECT ENGINEERING									
TOTAL									
BILLING CREDITS									
INTEREST									
ADJUSTMENTS									
GRAND TOTAL									

Fig. 3

with other companies for the less specialized types of telephone plant construction such as the building of central offices or warehouses, the construction of manholes and the placement of poles. These contractor services and other outside costs of construction are recorded through the medium of our accounts payable routine.

Allocated Costs. In addition to the five direct costs mentioned above, i.e., engineering, plant labor, materials disbursed, vehicle and contractors services or other direct purchases—there are a number of allocated costs which must be included to obtain the total costs of the construction work. These include:

Supply Expense. The cost of operating the purchasing, inventory control and warehousing functions of the supply department. These costs are spread over the value of the materials disbursed.

Second Level Plant Supervision. The costs of second level plant supervision, the vehicles used by these supervisors, and plant department clerical forces are spread over the direct labor cost of the groups concerned.

General Plant Administration. In the same way, the costs of general plant administration are spread over all labor costs of the plant department.

Tool Expense. The costs of operating the tool room, replacing small broken tools and depreciation of other tools are prorated over plant labor.

General Overhead Loading. While the four cost distributions mentioned above are made to virtually all costs including plant maintenance as well as construction, there is an overhead loading which is charged only to construction accounts and jobs to cover general company administration, plant accounting and other related costs which are properly includible in the costs of plant.

Interest During Construction. The practice of commissions of permitting companies a rate return only on plant in service excludes work in progress or plant under construction from the rate base. As a result, in some cases, utilities are permitted to charge construction jobs with interest during construction at 6 per cent per annum. The offsetting entry is interest income. This increases the valuation of assets which are placed in utility service and thus results in a larger rate base at that time to compensate for the exclusion of work in progress.

Accounting For Job Costs

Control Accounting. The capital costs of all the various "keep cost" jobs are controlled with a work in progress account number 100.2 called Telephone Plant Under Construction. *Fig. 1* shows the consolidated journal entry to this control account and indicates the source of all direct and some of the allocated charges. It should be noted here that many small routine orders on which we do not need job or specific unit prices—especially those where the entire project is completed within 30 to 60 days—are charged direct to their final plant codes and do not clear through work in progress control. Unit prices are figured annually in bulk for continuing property records purposes.

The consolidated journal entry to the work in progress control is sufficient for our general accounting purposes and permits the early issuance of our operating statement and balance sheet. The charges to the specific jobs and plant classifications, however, must be given separate treatment immediately following monthly closing operations.

Work in Progress Ledger. While work is in progress on a plant construction job, the Hawaiian Telephone Co. records monthly charges in the individual job ledgers with data accumulated by the type of charge, i.e., payroll, overheads, vehicle expenses, etc. (this breakdown facilitates reconciliation). Other telephone companies also maintain the account number breakdown by type of plant during the construction period.

The work in progress ledger sheet *(Fig. 2)* is the subsidiary record supporting the "Telephone Plant Under Construction" control account 100.2. Data for entry of charges to this ledger is obtained in the following manner. (The example shown is for accumulation of labor charges but the same principle applies for other items.)

(a) Source document for time charges—Daily Work Report.

(b) Postings of hours made throughout the month to labor summary forms. Separate labor and summary sheets are used for each job with the distribution by account numbers (plant classification) made in the various columns of this sheet. Separate sheets must also be made for each of the labor groups which work on the job since the groups will have different average hourly rates. These sheets are evaluated by account subsequent to monthly closing operations using rates established in step "c" below. The sheets are then filed by job number until completion of the construction work which may extend over many months.

(c) All of the productive hours of each labor group (i.e., time charged to all jobs and accounts-expense as well as capital) must be summarized separately for establishment of the rate and for evaluation. In preparing this group summary, the total time charged to the capital accounts for each job is used without the account breakdown.

(d) A general plant labor summary is made from the various intermediate summaries covering each of the specialized labor groups. This is the posting medium for the consolidated journal entry *(Fig. 1)*. All charges to the keep cost job number are entered as one figure to the control account.

(e) A work in progress control summary is prepared which picks up charges from all sources (plant labor —"d" above—vehicle expense, materials and supplies, etc., from similar summaries). This summary is balanced with control account posting made in the various columns of the consolidated journal voucher and is subsequently

(Please turn to page 40)

★ ★ ★ IN THE ★ ★ ★ NATION'S CAPITAL

by FRANCIS X. WELCH WASHINGTON EDITOR

Commissions showing tendency to recognize future cost trends in fixing rates. Utilities should be interested in "raids" made upon corporate managements of non-regulated businesses. FCC selects non-utility company to render marine radio service.

STATE commissions, during the past couple of years of rate case activity, have shown an increasing tendency to recognize future cost trends in fixing rates. The old idea about fixing future rates solely on the basis of averaged past cost experience has been under heavy pressure during the post-war period of galloping inflation.

Rate-fixing by a public utility commission is, of course, essentially an operation designed for the future. No commission ever fixes rates for the past. But, the position has often been taken that even fixing rates for the future must depend on the hard facts of past demonstration over a substantial period. Some of the commissions have extended this period of past demonstration to include one or even as much as two years. They have contended that only by the "averaging" of cost experience over a 12-month "test period" can the regulatory commission be sure of avoiding distortions of seasonal, or non-recurring variety.

While there is much to be said for the steadying influence of a well-averaged test period, it can be readily seen that the utility company stands to lose much advantage of any rate increase, if rates are keyed strictly to an average over a long past period, especially during a time of rapidly rising inflation.

And so, recently, commissions have been giving more weight to so-called "end of period" averages, in an effort to bring the cost experience down to the most recent available demonstration, in point of time. Even this process sometimes falls short of projecting known operating expense increases sufficiently into the future. The California commission recently had to make a series of compensatory adjustments for several utility companies because of tax developments occurring since previous rate orders had been handed down. These increases of expenses could have been anticipated. But, it is not the regulatory policy of that state to indulge in such expectation.

An interesting experience along this line developed this month in Kentucky. It was related in this department last week that the Kentucky commission had allowed Southern Bell Telephone & Telegraph Co. a rate increase of $1,245,769 a year, as compared with the company's request for a gross revenue increase of $4,418,000 a year. This was supposed to have permitted the company to earn a 6 per cent return, notwithstanding expected increases in operating expenses.

On Sept. 8, Southern Bell Telephone & Telegraph Co. announced that it would have to ask for a rehearing on its request for higher telephone rates—a step which may be a prelude to eventual court litigation. Explaining this step, Southern Bell management claimed that the rate increase would fail, by more than 1 million dollars, to provide the earnings which the Kentucky commission itself had said the telephone company should have. The company's statement on this was as follows:

"Analysis of the commission's order shows that the new schedule of rates cannot be made to produce earnings of 6 per cent as intended by the commission. In fact, the new rates will produce earnings of only about 5½ per cent at the present time, making no allowance for the factors which the commission recognized will depress earnings even further in the very near future."

The commission's order of Sept. 1—announcing the limited rate increase—contained the following paragraph on recognizing anticipated expense increases:

"While rates prescribed herein will . . . produce revenues slightly higher than we believe would be required . . . nevertheless we must recognize certain factors that will in the near future tend to depress these earnings. An aggressive rural development program, increases in employe compensation, and other expense adjustments will in our opinion reduce these theoretical earnings to the neighborhood of 6 per cent on its net investment."

The Southern Bell statement pointed out that the Kentucky commission had based its figures on 1953 operations. Then the statement went on to say "since the midpoint of that year—15 months ago—earnings have been further depressed by high cost construction and other factors recognized in the commission's order."

The company's Kentucky general manager said it is obvious that the commission intended to make allowance for the increased-cost factors when it handed down its ruling. The company spokesman emphasized that "this is not a new request for more revenue. It is a request for rehearing of the request we have already made." In its opinion, the commission had said it intended that the rate increase granted "should enable Southern Bell to absorb . . . additional cost and operate for a reasonable time in the future without seeking rate relief from this commission."

Another instance of the growing tendency of regulatory authorities to give practical consideration to the anticipation of obvious changes in cost experience is found in a recent Maryland case. This was the decision of the Maryland commission (also reported in this department last week) granting the Chesapeake & Potomac Telephone Co. a $2,316,000 rate increase, estimated to yield a 6 per cent return on an agreed "fair value" rate base. On the question of whether the rates fixed would actually produce the estimated

revenues, the Maryland commission had this to say:

"We are not convinced that we should at this time change the rate of return heretofore established as reasonable for the company. In view of the failure of the company to earn the authorized rate of return under the schedules of rates established by the commission in recent proceedings, we do feel, however, that we should make every reasonable effort to see that whatever rates we may now permit will enable the company to earn a return within the limits set.

"We are satisfied that to do this we must, in the present proceeding, take into account the conditions which now prevail and which will continue to prevail during the time that the rates to be established will be effective. Changes are bound to occur in almost any period and although some of these may be foreseen, others are wholly unpredictable. For example, at the time that the hearings were being held the maximum corporate income tax rate of 52 per cent was to be decreased to 47 per cent on Apr. 1, 1954 under the then law. The higher rate has been continued one year to Apr. 1, 1955, however, under the new tax bill. Needless to say, it is hopeless for us to predict what, if anything, will be done regarding this rate in the next year. We can say, however, that if the tax is reduced to 47 per cent and this reduction has the effect of bringing the return to the company beyond the established rate, the commission will be in a position to act promptly in the protection of the public interest."

"Raiding" Corporate Management

Recent efforts of enterprising financial promoters to upset long-existing management of industrial companies is commanding quite a bit of attention in financial circles these days. We saw what happened when a group of Texas oil men, headed by Robert R. Young, took control of the New York Central Railroad away from traditional New York financial interests. More recently, a young dynamic financial promoter, Louis Wolfson, has thrown down the challenge, for control of the Montgomery Ward & Co. mail order empire, to its aged board chairman, Sewell Avery.

We may have more of this sort of thing, especially where stockholders become dissatisfied—with or without good reason—about the efficiency of management which happens to be in the driver's seat.

Could this happen to a public utility company? It certainly could! As a matter of fact it did happen to the New York Central Railroad which is a member of one of the oldest branches of the utility family. Public utility company shares, by their very nature, are often widely held and greatly scattered. A determined drive, backed by sufficient financial reserves and adroit propaganda to unsettle the shareholders' confidence in existing management, could probably unhorse a number of utility companies' controls. That it doesn't happen more often may be traceable to the fact that it would not be worth what it would cost.

But there is both a danger and a lesson in this situation for existing public utility management. It is also a danger for both the utility consumer and the utility shareholder. In the case of the New York Central Railroad changing pilots, at least it could be said that the newcomer is a man with demonstrated experience.

Robert R. Young is certainly no stranger to the railroad business. He had already worked up a reputation for ability and resourcefulness as head of the Chesapeake & Ohio Railroad before he sold out his holdings in order to invade the bigger domain of the New York Central. What's more, Young had shown a determination not only to devote his career to public service but also to improve the lot of the customer as well as the shareholder, through more efficient and economical railroad operations. Whether these glowing promises will prove out remains to be seen. At least a majority of voting shareholders believed them, because Young had enough background to make a convincing case.

On the other hand, look what happened to another public utility which attracted the enterprising attention of Mr. Wolfson, now contending for control of Montgomery Ward. This was the Capital Transit Co., which serves the District of Columbia and suburban Maryland areas.

In 1949 Mr. Wolfson, admittedly without previous experience in the operation of any regulated utility busi-

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REA Approves Loans in Texas and South Dakota

Loans for improving and extending rural telephone service in Texas and South Dakota were approved by the Rural Electrification Administration, the U. S. Department of Agriculture announced on Sept. 8. Details follow:

Baltic (S. D.) Telephone Co. on Sept. 1 was allocated $102,000 to finance the improvement and extension of rural telephone service in Minnehaha County.

Baltic's system is presently furnishing magneto service to 235 subscribers and 29 switchers. With the REA loan, the borrower plans to convert the system to dial operation, rebuild 25 miles of the existing line and construct 7 miles of new line.

These changes will make it possible for the organization to bring improved service to the existing subscribers and service for the first time to 32 rural families in the vicinity. The borrower will continue service to the switchers.

The completed system will consist of 100 miles of line. Joseph N. Ausen is president of this mutual company.

* * *

Eastex Telephone Cooperative, Inc., Henderson, Tex., on Sept. 2 was allocated $248,000, the second loan to this borrower.

The loan funds will enable the co-op to serve more than 400 additional subscribers in an expanded service area. It proposes to acquire the Elysian Fields Telephone Co., now serving 147 subscribers.

In addition, the cooperative plans to construct facilities for a complete new exchange in the Oakhill community. Improvements will include new dial central offices at Elysian Fields and Oakhill, and about 100 miles of new line as well as 14 miles of rebuilt line.

These changes will enable the Eastex co-op to provide improved service to the existing subscribers and initial service to 259 rural families now without telephones in the expanded territory.

Since the first loan of $458,000 was approved in December, 1950, the borrower has completed the first section of the system and is serving about 500 subscribers through the Laneville, Good Springs, Minden, Pine Hill and Mount Enterprise dial offices.

The two REA loans will make it possible for the borrower to serve a total of 1,400 subscribers through seven dial central offices in Rusk and Panola counties. The finished system will consist of 487 miles of line. Otho Morris is president of the Eastex cooperative.

CARRIER SYSTEMS

By HAROLD B. McKAY

Part 9—Trouble Shooting Methods

THERE ARE two main approaches to locating trouble in electrical apparatus. One is called "signal tracing," the other is simple voltage measurements.

Signal tracing is just a radio man's term for the methods which have been used by telephone men ever since the telephone was invented. It merely means to put the appropriate signal into a system, then check with a receiver or meter at different points through the apparatus until the point is found where the signal disappears, and there lies the trouble.

It is the old method of following battery to ground. It is the same thing a repairman does when he climbs several poles along a lead, testing to determine if the trouble is before him or behind him.

While in the voice path on carrier systems, a tone source would be used instead of battery and ground, and a test receiver can still be used to shoot the trouble, just as in any telephone system.

Voltage measurement trouble shooting relies upon the idea that if anything fails in a vacuum tube circuit, a voltage change, or departure from normal will occur at some point. For instance, if a resistor goes open, the voltage drop across it will disappear and the voltage applied to it will increase because the load will have been removed. A shorted component will ground out the voltage at that point, reducing it to zero. A shorted condenser may cause a dc voltage to appear at a point where there should be none.

In this connection, it should be noted that a record of normal voltages for a given circuit should be kept handy. Some circuit diagrams show the correct voltage which should be read at different parts of the circuit. If this is not available, a comparative test might be made with another system which is working.

The voltage check method usually refers to the fixed dc voltages which appear on the different elements of each tube or other components because, within limits, these should remain nearly the same at all times while the system is working.

Another useful voltage check is the measurement of the alternating current voltages at different points while the system is operating. These voltages will not ordinarily be on the manufacturers circuit diagrams, because they are subject to adjustment when the system is installed. It would be wise, then, when a carrier is lined up, to measure with a vacuum tube voltmeter and make a record of the ac voltages present in the system.

Oscillator Voltage

The carrier oscillator voltage should be measured somewhere near the oscillator tube, and again after it has gone through modulators, regulators, filters, etc., and is ready to go out on the line.

If a 3,700-cycle, or similar system of signalling is used, the voltage of this should be measured in both on-hook and off-hook conditions.

For voice frequency, a 1,000-cycle tone of constant, regulated value (usually 1 milliwatt) should be sent into the input of the system, and the voltage of this measured at different points until it mixes with the carrier in the modulator. These voltages may vary from system to system, or even from channel to channel in the same system, but a record should be made of them when the system has been adjusted to operating efficiency.

These voltage measurements will be of great value in clearing trouble at a later time, as a few quick checks with a meter will quickly confirm or refute the diagnosis previously made.

In carrier work, the combined use of the signal tracing and voltage measurement techniques has been found to be very useful. In practice, the signal tracing method can be used to track the trouble down to the part of the circuit in trouble. Because most electronic circuits are built around vacuum tubes, signal tracing is usually done by searching for the signal as it enters and leaves each tube.

Each tube has around it a cluster of associated apparatus, including perhaps input and output transformers, grid, cathode and plate resistors. When, by signal tracing, the tube is reached where the signal disappears, a voltmeter may then be used to check the voltage on each piece of apparatus associated with this tube or "stage" of the equipment.

DC Voltmeter

The voltmeter generally used for this type of dc testing is usually a 20,000 ohms per volt volt-ohm-milliameter. The vacuum tube voltmeter measures ac voltage only.

The dc voltmeter can be used to measure most of the voltages in a carrier system. However, it cannot be used for accurate reading on the grids of vacuum tubes. This is because the grid is connected to a very high resistance, 500,000 ohms or so, and draws little if any current. If a voltmeter which has a lower resistance is used, (and all direct reading dc meters are too low for this purpose) this lower resistance of the meter will become

part of the circuit, and completely upset the grid conditions required for proper operation. Of course, it will do no harm, but if a grid reading is obtained at all under these conditions it will show to be much lower than it actually is with the meter removed.

Most grids, as explained in our section on vacuum tubes, derive their grid voltage from the voltage drop over a resistor in another part of the circuit. This is most often obtained by a cathode resistor, in which case the grid voltage can be determined by measuring the drop across the cathode resistor, and not touching the grid. This does not, however, check the possibility of the grid resistor being open.

This is where a good knowledge of vacuum tube theory comes in. The grid of a tube regulates the amount of current that travels through the plate circuit. If the grid goes open, it loses this control and the plate current will become excessive. In large tubes this current can become enough to melt the elements in the tube. So, in this example, if the grid resistor were open, the voltage on the plate would be lower than normal, because of the increased drop across the plate load resistor caused by the increased current. Paradoxically, the cathode resistor voltage drop would also be increased, which would seem to mean a high voltage on the grid when actually there would be none.

The use of the ohmmeter portion of the volt-ohm-milliameter is useful in these matters. When a voltage appears to be wrong at any point in the circuit, the usual method is to turn off the power, then test the resistors and capacitors in that part of the circuit with the ohmmeter. Condensers should be checked to see that they are not shorted, resistors tested to determine that they are within the value limits specified on the print or by markings on the resistor itself.

Filters

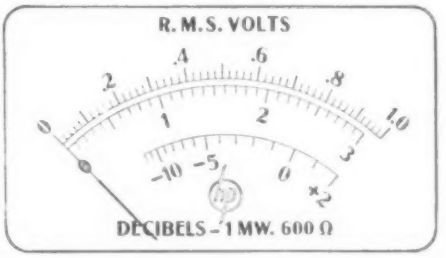
Some of the more difficult types of trouble to analyze are those connected with malfunction of filters. A filter usually consists of several coils and condensers, one of which may fail. This failure may not make itself apparent through any tests that can be made with regular meters by testing at the terminals. Even tests of the individual components (if one is brave enough to take the filter apart) will not reveal such things as a few shorted turns in a coil.

When a failure occurs in one of these units, it usually results in its frequency response changing. That is, it may no longer pass the frequencies it is supposed to pass, and it may pass some that it is supposed to block. This cannot be detected by meters which measure only voltage. The vacuum-tube voltmeter (vtvm) for example may show ac going in and ac coming out, but it may be the wrong frequency.

If spare filters are on hand, substitution can be made which will prove or disprove the theory that the filter is bad, but small installations do not ordinarily carry such spare parts.

There are instruments which are frequency selective. One such instrument tunes like a radio set to different frequencies and measures the voltage on a meter. Oscillators are obtainable which will put only one frequency into a filter, so that a voltmeter can be used to check if it is getting through.

These instruments are of laboratory grade and are ordinarily too expensive to have lying around waiting for a filter to fail. But the best of instruments will not take the place of the maintenance man's skill, and like so many other things in the telephone plant, filter troubles will yield to skillful analysis.



The meter scale on the vacuum tube voltmeter reads in either volts or decibels. The top two scales here are in volts, the bottom in decibels. For accurate reading in decibels, the instrument should be connected to a 600-ohm circuit. (Drawing courtesy of Hewlett Packard Co.)

In this connection there is another concept which must be fixed in mind by the telephone man who is going to repair carrier equipment; that is, that shorts and opens in electronic gear do not behave as they do in dc telephone circuits.

When a telephone line becomes shorted or grounded, the indication is usually positive: A lamp burns permanently, a fuse blows or a relay remains operated.

In the matter of carrier filters a shunt path can become misleading and indicate as an open instead.

Think of a three-channel system, with each of the channels having an input filter all of which are connected in parallel to the wire line. Suppose the filter in channel three fails in the receiving direction. Instead of passing the only frequencies for channel three, it also absorbs the signal for channel two.

Channel three may continue to work "OK," but the failure shows up on channel two. A vacuum tube voltmeter will show carrier frequency going in to all three filters. Carrier voltage can be measured coming out of channel one and three and going into the tubes, but low or no voltage will be read on channel two.

Ordinarily one would suspect the filter in channel two to be open. Actually, because carrier currents are so low, the amount of channel two current which would be leaking through the bad filter in channel three, would act as a shunt or short, which would not leave enough current to pass through the channel two filter.

While this trouble could not be located with a voltmeter, it could be found by removing any wires which might lead to a shunt path. In this case, disconnection of each channel separately from the line would show up the trouble.

A similar situation can arise in systems where the voice and signal frequencies are carried on the same channel. In these systems, on the receiving end, the incoming carrier after it is fed through the demodulator, branches into two filters, one of which passes the voice into the voice amplifiers and then to the tip and ring of the switchboard circuit, and another filter which routes the 3,700-cycle signal frequency into a relay circuit which emerges ultimately on the "E" lead to the external signal equipment.

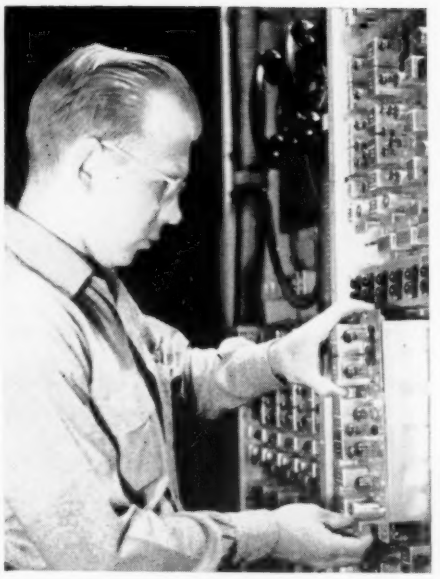
In normal operation, the voice and the signal each stays on its separate path. However, a breakdown of the signal filter could let voice frequencies into the signal circuit, or the voice filter could develop trouble which would route signal frequencies into the voice circuit.

In each of these cases, the normal function of the defective filter might not be impaired. That is, if the voice filter goes in trouble, it still may permit the voice to get through, but it can by-pass enough of the signal energy to prevent that part of the circuit from working.

Voltmeter tests sometimes may be completely misleading, and indicate the trouble to be in the wrong filters.

In the dc portions of electronic circuits, similar effects can occur. A ground on a circuit carrying little current will not show up in overheated parts, operated relays or permanent lamp signals. In fact, at first glance, because the voltage is not getting through, it may suggest an open rather than a ground.

A rule to remember then, is to suspect shunt paths whenever a signal or voltage does not get through. Make



LEFT PHOTO: A typical trouble shooting operation is shown here as switchman, J. A. McKEE, checks on a permanent signal report on a carrier circuit. By removing the first tube in the signal receiver, he determines at once if the trouble is at this end or at the sending end. He uses a test receiver to check at the tube socket terminals. CENTER PHOTO: With plug-in type of equipment, the defective channel unit is removed from the terminal for further testing. RIGHT PHOTO: The volt-ohm-milliameter is now used to check voltages and resistances on the channel unit after it has been removed from the frame.

sure by opening any leads which might cause a current to be diverted into a path which will absorb or misroute it.

Impedance

In making dc voltage checks, it should be remembered that specified voltages hold true only when a circuit is complete; that is, when the voltage source is connected to its regular termination or load. Therefore, if wires have been opened in order to isolate trouble, the voltages connected to these wires may change.

When measuring ac voltages in signal, carrier frequency or voice paths, remember that these circuits ordinarily work into transformers or other components which provide an impedance match. For instance, the grid circuit of a vacuum tube is usually very high impedance. This is because the grid itself is practically an open circuit.

The plate circuit of a tube is also high impedance, but not as high as the grid. That is why resistors or a transformer are used to couple the plate of one tube to the grid of the next by changing the impedance. The output of a carrier system contains impedance matching devices which step down the high impedance of the electronic circuit to the much lower impedance of the line.

All this adds up to the fact that when a voltmeter is placed into any of these circuits, it will upset the impedance match somewhat. This will not hurt the circuit, but it will not give a correct voltage reading either. The vacuum-tube voltmeter mentioned earlier is used principally because the input impedance of this meter is high, on the order of millions of ohms. A resistance this high has but little effect when connected into carrier circuits. However, if voltmeters are used which are not of the vacuum tube type, readings will be accurate only if the meter matches the impedance of the circuit under test.

The Decibel

Every text on communication, it seems, devotes several pages to explaining the decibel (db). Because an understanding of this unit is not essential for the maintenance of carrier systems, a complete explanation of the mathematics will not be given here.

The first thing to remember about the decibel is that it is a unit of power, and any power which is expressed in decibels could also be expressed in watts. The difference is that the watt is a constant unit, while the decibel is not. The decibel expresses a ratio. That is, if some device has a power of 10 decibels, this figure means nothing unless you are told that it is 10 decibels compared to something else.

In amplifiers, the overall amplification is expressed as so many decibels "gain." This means the output power compared to the input power. Another way of saying it would be that the circuit amplifies so many "times."

The technical definition of the decibel is "10 times the logarithm of one power divided by another," if you are interested in figuring it out. Thus, the decibel has no fixed value. While zero watts means definitely no power at all, zero decibels means any one of several different wattages.

In communications equipment, zero decibels is often defined as the power of 1 milliwatt in a 600-ohm load. However, some manufacturers have used 12 milliwatts as a reference point, others have used 6 milliwatts; other circuits are based upon 500 ohms instead of 600 ohms, etc.

The telephone standard now is 1 milliwatt in 600 ohms, and is called "dbm" instead of just plain "db." However, this is not the end of it: Noise measurements are often made with "dba," cross-talk measurements with "dbx" and television repeater tests with "dbv," all of which have different values.

The repairman who is not interested in the mathematics of the subject can get by very nicely by remembering that the db is a measurement of power, and the more db the more power. Further, instruments like the 400D vacuum-tube voltmeter have both db and voltage scales under the same pointer, and any given reading can be quoted in either db or volts as one sees fit.

The decibel readings of any meter, however, will be correct only when the circuit under test is of the proper impedance. In the case of the 400D, the db scale is based upon one milliwatt in 600 ohms, and if you are testing a 600-ohm circuit the readings will be accurate. In other impedances the readings will not be correct, but can be used for comparisons between circuits.

Summary

In summary, it might be said that a carrier system is just another piece of telephone apparatus that works on simple principles when analyzed. Like other apparatus, the voice or signal goes in one end and comes out the

other, and the paths can be readily checked for trouble with the same test equipment the telephone man has always used—a test receiver and a voltmeter.

The following items are widely used in carrier maintenance:

Volt-ohm-milliammeter with a sensitivity of 20,000 ohms per volt. These meters measure low frequency ac and dc voltages on several scales, usually ranging from about three volts to 300 volts or more. They also measure resistance on several scales covering ranges from less than a thousand to more than a million ohms. Some models provide direct coupling to the meter movement so that milliamperes and amperes can be measured.

Vacuum-tube voltmeter. The kind used in carrier work, like the Hewlett-Packard model 400D measures ac volts and fractions of a volt only, although the scale interprets the reading also in decibels under the conditions mentioned above. This meter has an additional feature which is very useful in telephone maintenance. The instrument contains an amplifier, which is used to amplify weak voltages up to a point where they will move the meter.

This amplifier has terminals on its output which are brought out to the front of the panel. This enables the use of a telephone receiver at this point so that the repairman can listen to as well as read the voltage being tested. This is particularly useful in running down noise conditions, both on carrier and voice frequency circuits, because often the repairman can tell by the sound of the amplified noise what the nature of the trouble is.

Procedure

Following is a resume of the steps to take in shooting carrier trouble as described above:

(1) Test the wire line, to make sure it is not in trouble.

(2) Check the switchboard apparatus or dial circuits connected to the carrier to make sure these are "OK." Check fuses and power supply. In other words make sure the trouble is in the carrier equipment itself.

(3) Supply the appropriate signal. On a voice circuit, tone or a filtered buzzer signal should be connected to the input. On a signal circuit, provide a definite on-hook, or off-hook condition as required, or use as interrupter such as busy-back.

(4) From the behavior of the associated circuits, "think out" the carrier operation and come to a conclusion as to which part of the carrier could be causing the trouble.

(5) Check the tone or signal with a test receiver to the grid of each tube as it goes through the equipment. Use a vacuum-tube voltmeter after the signal has passed the modulator and becomes high frequency (quick partial checks can be made from the front of the apparatus by removing the tubes, one by one, and probing the socket hole which connects to the grid with a receiver or meter).

(6) When the point at which the signal or tone stops is located, test all resistors and capacitors associated with this point and make voltage checks at the checkpoints indicated on the print.

(7) On the receiving portion of the circuit, if the trouble lies there, the same procedure may be used, bearing in mind that the signal being traced is coming in off of the line instead of going out on it.

(8) On equipment having a regulator, consider the possibility that this may have failed.

The foregoing methods of trouble shooting have been used with success by telephone men with no previous carrier or radio training. The important thing in the maintenance in any piece of apparatus is that the repairman not be afraid of the equipment because it is new.

Usually a few days spent in lining up or installing a new carrier system is all that is necessary to overcome this timidity. The practice in making the line-up has in many cases proved adequate to enable the maintenance man to start shooting carrier trouble immediately, using methods similar to those described here.

* * * *

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BIBLIOGRAPHY

Like other phases of the telephone business there is not a great deal of published material on carrier systems. The best information to have on any system is the diagrams and data supplied by the manufacturer with the installation. However, the following books contain information which may prove helpful to one who is interested in learning more about this equipment:

Fundamentals of Carrier Telephony. Rural Electrification Administration Section 901. An 18-page mimeographed paper containing explanations and diagrams of carrier operation. Section 910, a separate publication, contains 15 pages of information on subscriber line carrier systems.

Electrical Communication Systems Engineering. (TM 11-486). Superintendent of Documents, Washington D. C. $2.50. Carrier equipment described is military, but information on line construction could be useful. This book was reviewed in the *June 5, 1954* issue of TELEPHONY.

Radio Engineering by F. E. Terman. This book is the "bible" for many radio engineers and technicians. Though regarded as a college text, it can be easily read by anyone with an electrical background. Mathematics are at a minimum and formulas used are fully explained. While not treating telephone carriers as a subject, this book contains all of the basic theory involved in any type of electronic apparatus. This volume tells the "why" of things as well as the "how." This book can be purchased from TELEPHONY.

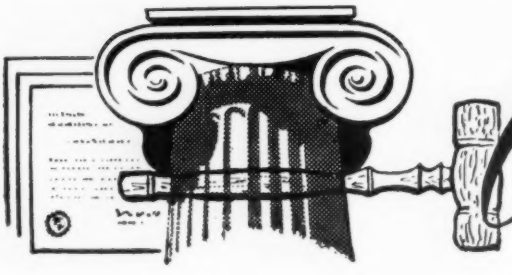
Principles of Electricity Applied to Telephone and Telegraph Work (1953 edition). This is a training text prepared by the AT&T Long Lines Department. It contains excellent material on all types of telephone apparatus, with considerable space devoted to carrier. It has many explanatory diagrams, and the theory of operation of different types of equipment is made very clear. Considerable mathematics are used in some portions of the book. This volume is obtainable through Graybar for about $4.00.

Tube Handbook. A radio tube handbook showing the types of tubes used in the equipment. Of principal importance are the basing diagrams in these books, which show what socket terminals the grid, plate etc., connect to. Each tube manufacturer prints such books, at prices from $.50 to $1.00. The RCA handbook is useful because of a comprehensive explanation of vacuum tube theory which appears in the first part of the book.

The End

V V

"America today is undergoing that difficult, and sometimes dangerous, transition from war to a peacetime economy, and all of us are closely watching every economic index that records a change in business activity. But prosperity, unfortunately, is not a mere statistic. It is primarily a state of mind: and if we permit anything or anybody to destroy the confidence of the American people, or to undermine their faith in the future, neither we nor the government can prevent a depression. And that is why I believe that those who are exaggerating and distorting this very minor decline in the level of our prosperity are playing a dangerous game that can never be worth the candle—no matter how helpful this tactic might prove in advancing their private political fortunes."—BENJAMIN F. FAIRLESS, *chairman of the board, United States Steel Corp.*



Courts and Commissions

Asks Tax Ruling on Extra Help Employed to Answer Telephone

If a physician hires extra help for his home so that his telephone can be manned all the time, is it an "ordinary and necessary business expense?"

Dr. Harry C. Powelson of Zanesville, O., insists that it is, but the U. S. Internal Revenue Service in Washington, D. C., takes the opposite view, it was reported on Aug. 30.

So the Zanesville doctor has taken his case to the Tax Court of the United States, protesting against the revenue agency's refusal to allow him to deduct $1,322 on his 1950 tax return and $1,707 on his 1951 return for his "telephone girl."

Dr. Powelson, whose gross income for the two years totaled more than $342,000, declares in a joint petition with his wife, Mrs. Elizabeth Powelson, that his patients regard his residence telephone as a supplement to his office telephone. He said he has "maintained extra help in the home to provide continuous and efficient telephone service" for his patients.

And he said that "a reasonable allocation" to the cost of this telephone service was the $3,029 he deducted for the two years as "ordinary and necessary business expense."

Therefore, he contended that he does not owe the additional $1,594 in income taxes the revenue service is trying to collect from him. The doctor made no protest against adjustments in his dividend income made by the tax agency, but he asked a redetermination of his tax bill and a reversal of the revenue agency's refusal to count his "telephone girl" as a business expense.

V V

Hearing Aid Company Official Sues SW Bell for Refusing Ad

A $650,000 damage suit has been brought against Southwestern Bell Telephone Co. by the operator of a hearing aid company, it was reported on Aug. 28.

A. P. Towne charged in a suit filed in Houston, Tex., civil district court that the telephone company, in refusing to accept certain advertisements he submitted for the yellow pages of the company's directory, discriminated against him.

His attorney said that Mr. Towne is a regular advertiser in the company's Houston directory and in 66 other directories published by the telephone company in this area.

"My client contends that failure to run these ads in the directory which came out in June has destroyed a national project he planned."

Comment from the telephone company was not immediately available.

V V

General Telephone of Southwest Gets Higher Rates in Texas

General Telephone Co. of the Southwest, San Angelo, Tex., recently obtained the rate increases for the following Texas exchanges:

Exchange	*Old*	*New*
Amherst		
Dial, 283 stations		
One-party business	$5.00	$ 7.00
Two-party business	4.00	5.75
One-party residence	3.00	4.00
Two-party residence	2.50	3.25
Brownfield		
Dial, 2,507 stations		
One-party business	9.50	12.50
Two-party business	7.50	10.00
One-party residence	4.75	6.25
Two-party residence	4.00	5.25
Four-party residence	3.50	4.50
Bovina		
Dial, 191 stations (extended area service)		
One-party business	6.25	7.25
Two-party business	4.75	5.50
One-party residence	3.50	3.70
Two-party residence	3.00	3.15
Friona		
Dial (extended area service)		
One-party business	6.50	8.00
Two-party business	5.00	6.25
One-party residence	3.75	4.15
Two-party residence	3.00	3.30

V V

Southern Bell T&T Gets Some Kentucky Rate Increases

Proposals by Southern Bell Telephone & Telegraph Co. for higher rates for residence and business service were rejected on Sept. 1 by the Kentucky Public Service Commission, but higher charges for intrastate long distance calls were allowed, starting Sept. 1.

The company had asked for rate increases totaling $4,418,000 annually. The commission denied $3,172,131 of the requests, but allowed increases totaling $1,245,769 annually.

Approximately half of the approved rate increases will come from users of long distance service within the state. The rest will come from users of special services, such as teletypewriters, additional name listings in directories, changes for moving equipment, service connections, and restoration of service.

In a statement at Louisville, Homer G. Bartee, Southern Bell general manager, expressed disappointment at the decision and said it meant the company would have to ask additional rate boosts much sooner than otherwise would have been necessary.

The company's request for higher Kentucky rates, the sixth since 1946, brought to $13,858,000 the total of additional revenue it has requested. The commission in that period has allowed increases totaling $7,667,869 and has denied $6,180,031 in proposed increases.

During hearings before the commission, C. Hunter Green of Louisville, the Kentucky manager for the nine-state Southern Bell system, testified that the company would get only $2,047,000 of the $4,418,000 increase requested. The rest, he said, would go for federal, state, and local taxes.

Green testified that rising costs of labor, materials, and supplies had cut the company's earnings in Kentucky to about 4 per cent on the $85,000,000 it has invested in plant and equipment. The higher rates, he added, would permit the company to earn 6.75 per cent.

Classes of service for which rate increases were denied were: Residence and business basic rates, extra exchange-line mileage charge, business auxiliary lines, toll terminals, service stations and leased circuits, joint users, and branch-exchange flat-rate trunks.

V V

Rochester (N.Y.) Company Seeks Higher Telephone Rates

Rate increases that would bring $815,000 additional annual revenue were sought by the Rochester Telephone Corp. in an application filed on Sept. 2 with the New York Public Service Commission.

Corporation President Donald H.

Campbell said that the increases were made necessary by higher wages and taxes and falling earnings.

V V

Nebraska Commission Grants Rate Raise to Independent

A general rate increase was granted the Indianola Telephone Co. on Aug. 20 by the Nebraska Railway Commission. New rates became effective Sept. 1 (TELEPHONY, Sept. 4, p. 33). Former and new rates are as follows:

	Old	*New*
One-party business	$3.50	$4.25
One-party residence	3.00	3.25
Two-party residence	2.50	2.75
Four-party residence	2.00	2.25
Rural business	3.00	3.35
Rural residence	2.50	2.85

These rates are on a net basis inasmuch as the company does not use a prompt-payment discount plan.

The order will produce an estimated additional gross revenue of $1,568.40 per year. Total annual operating revenue is estimated at $19,367.24 and expenses at $14,864.49 exclusive of $1,576.83 in taxes. This results in a 5.09 per cent return upon a rate base of $57,453.99. This rate base includes the net book value of plant and equipment, plus an allowance for cash working capital and plus materials and supplies.

The company serves 410 subscribers in Indianola and rural areas adjacent to the community. This includes 31 service station subscribers.

V V

Sale of Minnesota Company OK'd

The Minnesota Railroad & Warehouse Commission on Sept. 7 approved the purchase of the Wrightstown Telephone Co. by the Bertha (Minn.) Telephone Co. The Wrightstown company has been operating in Otter Tail and Todd counties, serving approximately 51 stations.

V V

Names California Commissioner

Governor Knight of California appointed on Sept. 1 Ray Edward Untereiner of Pasadena as a member of the California Public Utilities Commission to succeed R. E. Mittelstaedt of Sacramento, retired. Subject to state senate confirmation, the appointment is for a term ending Jan. 1, 1959.

V V

Seeks Sale O.K. in Pennsylvania

On Sept. 7, the Pennsylvania Public Utility Commission was scheduled to hear the application of General Telephone Co. of Pennsylvania, Erie, to buy Citizens Telephone Co., Davidsville.

C&P of Maryland Authorized To Raise Rates $2,316,000

The Maryland Public Service Commission on Sept. 1 authorized the Chesapeake & Potomac Telephone Co. of Maryland to increase rates a total of $2,316,000. The company had filed a petition for increases amounting to $6,864,000.

The rate base used for this case was agreed on as the value of the property as last determined by the commission plus net additions since the date of the last valuation. The previous commission determination of fair value amounted to 102 per cent of net book valuation.

The commission found 5¾ per cent to 6 per cent to be a reasonable rate of return and employed 6 per cent in calculating permissible net income. The 6 per cent of return was applied to a rate base adjusted for estimated net additions through December, 1954. By stipulation of the parties working capital was excluded from the rate base.

V V

N. C. Highway Commission OK's Chemical Brush Control

The North Carolina Highway Commission on Sept. 9 adopted a policy which will allow telephone companies and other utilities to continue using chemicals for control of roadside vegetation, but under tight restrictions.

A committee named by the commission recently to look into the situation after complaints were received about the practice, reported that "careless application of chemicals," had resulted in "unnecessary killing of vegetation" and that there had been an unwise selection of chemicals used and of the season for their application.

The report stated that proper use of chemicals would result "in substantial saving in utility line maintenance" and that careful planning can "preserve desirable roadside plants" and at the same time "eliminate bushy growth."

V V

Applies for Lease Approval

The Champaign (Ill.) County Telephone Co. was to have applied to the Illinois Commerce Commission on Sept. 15 for approval of an agreement for leasing the Cheneyville (Ill.) Telephone Co.

V V

Two Ohio Independents Merge

The Ohio Public Utilities Commission has approved a merger of the Elida Mutual Telephone Co. with the Lima Telephone & Telegraph Co., it was reported on Aug. 29. Such action ends a territorial dispute which has been going on since 1911, both companies serving the Allen-Putnam County area. This territory was reported to be the last in Ohio in which two telephone companies operated simultaneously.

V V

Oklahoma Company Asks OK Of Two Rate Schedules

The Bixby Telephone Co. recently asked the Oklahoma Corporation Commission to approve higher rates for its common battery system.

The company also asked another increase if it should convert to dial operation.

The company is owned jointly by Dr. R. E. Dailey of Bixby and Dr. W. H. Newlin of Broken Arrow.

"We have asked for the higher rates in order to install dial telephones," Dr. Dailey said. "When we get new equipment we will be able to supply telephones to everyone who wants them."

V V

Illinois Bell Gets Rate Raises For Indiana Exchanges

The Indiana Public Service Commission on Sept. 9 approved a rate increase for the Illinois Bell Telephone Co. in Lake County, Ind., which will produce additional gross income of $1,241,654 a year (TELEPHONY, Nov. 7, 1953, p. 38).

The commission order emphasized that the federal government will take more than $600,000 of the increase in taxes, leaving only $584,000 in annual income for Illinois Bell.

It pointed out that the rate increase will give Illinois Bell a net annual income of $978,000 from its Indiana telephones and that the sum represents a 6 per cent return on an investment of $16,300,000.

Illinois Bell wanted the return based on a 20.5-million-dollar valuation, including money being spent to convert Hammond to dial operation.

Commissioner M. Elliott Belshaw, a resident of Lake County, said until the Hammond dial conversion actually was made it should not be added to the rate base. Even when the conversion is made, he added, Illinois Bell probably would not be eligible for another rate increase.

V V

Nebraska Company Asks Raise

The Gurley Telephone Co. recently asked the Nebraska Railway Commission permission to increase its rates.

V V

Authorizes Sale in Florida

Florida Railroad & Public Utilities Commission on Sept. 7 approved the

(Please turn to page 30)

GENERAL TELEPHONE COMPANY
OF CALIFORNIA
1314 SEVENTH STREET
SANTA MONICA, CALIFORNIA

June 21, 1954

Mr. H. F. Lello, Executive Vice President
Automatic Electric Company
1033 West Van Buren Street
Chicago 7, Illinois

Dear Mr. Lello

On May 29 and 30, The Pacific Telephone and Telegraph Company cut their Los Angeles 4A X-Bar Toll Switching System into service.

This system connects with 30 of our dial central offices in the Southern California area all of which were equipped with new intertoll dialing equipment designed by your engineers to meet the varied requirements imposed by several varieties of toll trains installed in our offices.

We believe you and your engineers will be pleased to know that the equipment provided worked satisfactorily at all installations and required no major modifications or exceptional adjusting effort to meet the stringent pulsing and supervisory requirements imposed by the 4A X-Bar Toll Switching System.

This was probably the largest conversion of this type in which an independent telephone company will be involved and we wish to express our appreciation for the excellent design work of your engineers and the splendid cooperation of your people during the several years of negotiation in which these design features were being formulated.

Yours very truly

Dean M. Barnes

DEAN M. BARNES
Operating Vice President

Successful, trouble-free, economical conversion to Nationwide Toll Dialing—you're sure of it with Automatic Electric! Here's Automatic's sound program.

Proof ←

of the soundness of Automatic's program is shown at the left—an unsolicited, enthusiastic letter from Mr. D. M. Barnes, operating vice president, General Telephone Company of California—one of Automatic's long list of satisfied customers.

It pays to consult Automatic on Nationwide Toll Dialing!

Will *your* exchange give instant, top-grade service the moment you tie in with Nationwide Toll Dialing? Have you solved the technical problems it presents? Are you making adequate preparations for the increased, profitable toll traffic it will bring you?

You'll be able to say "yes" to all of these urgent questions if you follow Automatic's program:

1. **Insure high-grade transmission,** proper supervision, and "right of way" to income toll calls by installing Strowger Automatic Toll Train Switches.
2. **Save buying excess switches** when converting exchanges requiring less than seven digits to the required seven-digit numbering plan. Install Strowger Automatic drop-back "2-5" selectors.
3. **Insure dependable toll dialing** for your subscribers. Know exactly what facilities you'll need on trunks going out to Bell exchanges. Consult with your connecting Bell company and with us.

This program will give you the same satisfactory operating results reported by Mr. Barnes. Consult Automatic Electric today!

AUTOMATIC ELECTRIC

Originators and Developers of the Strowger Step-by-Step "Director" for Register-Sender-Translator Operation . . . Machine Switching Automatic Dial Systems

Makers of Telephone, Signaling and Communication Apparatus • Electrical Engineers, Designers and Consultants

Distributors in U. S. and Possessions: AUTOMATIC ELECTRIC SALES CORPORATION
Export Distributors: International Automatic Electric Corporation
1033 West Van Buren Street, Chicago 7, U. S. A.

sale of the Mayport Telephone Co., Inc., to the Southern Bell Telephone & Telegraph Co. The Mayport company serves about 80 subscribers.

V V

J. P. Thompson Appointed to Colorado Commission

Governor Thornton on Sept. 4 announced the appointment of John P. Thompson of Denver, an attorney, to the Colorado Public Utilities Commission, to fill a vacancy caused by the resignation of John H. Winchell. His term will expire in January, 1959.

Mr. Winchell resigned the post to accept an appointment on the Interstate Commerce Commission (ICC) in Washington, D. C.

Governor Thornton also announced the appointment of Joseph W. Hawley, currently a member of the commission as chairman—the post left by Mr. Winchell. The third member is Ralph C. Horton of Alamosa.

V V

28 TV Stations to Be Added to Bell Network During September

Network television service is scheduled to be extended this month to 17 additional cities, and into the states of North Dakota, New Hampshire and New Mexico for the first time, according to the Long Lines Department of American Telephone & Telegraph Co.

Plans call for 28 TV stations to be connected to the Bell Telephone System's nationwide facilities during the month of September.

Long Lines, which provides the nationwide network of television pathways, said this represents the largest number of stations to be interconnected for any one month this year. At present some 309 stations in 198 cities in the United States are linked for network television.

ARTHUR L. LEAZENBY (left), a Michigan Bell Telephone Co. vice president, who will retire on Sept. 1. The company also announced that J. L. CONROY (right), assistant general commercial manager since 1952, and a veteran of 26 years with the company, was appointed assistant vice president in charge of independent company, defense, and special staff activities, effective Aug. 1. Mr. Leazenby began his telephone career in 1912 as a clerk, and became general traffic manager in 1942, a post he held until appointed vice president in 1953.

The company said some 1,400 miles of new microwave facilities were required to put the following cities on network routes: Albuquerque, N. M.; Alexandria, La.; Asheville, N. C.; Cape Girardeau, Mo.; Duluth, Minn.; Durham, N. C.; Enid, Okla.; Fargo, N. D.; Hartford, Conn.; La Crosse, Wis.; Las Vegas, Nev.; Manchester, N. H.; Marinette, Wis.; Mobile, Ala.; Pensacola, Fla.; Pittsburgh, Kan.; and Poland, Me.

Among the new route sections, a 302-mile radio relay system from Amarillo, Tex., to Albuquerque covers the most distance. It includes 10 intermediate towers which will relay the microwave signals used in the radio relay method of transmission.

The scheduled September interconnections also would provide additional network outlets in Charleston, S. C.; Charleston, W. Va.; Harrisburg, Pa.; Lake Charles, La.; Salt Lake City, Utah; and Sioux City, Iowa. Two other stations were to be added at San Diego, Cal., and Valley City, N. D. (Fargo studio).

The Bell System has also announced that Station WJNO-TV, West Palm Beach, Fla., recently received its first network programs over the Bell nationwide facilities.

V V

Illinois Commission Charters New Rural Independent

Allen Grove Mutual Telephone Co. on Sept. 8 was granted a state charter to operate in Illinois as a not-for-profit corporation.

Incorporators are Russell Cross, Carl Stansberry and George Meeker.

The Flushing, O., exchange of Ohio Consolidated Telephone Co., Portsmouth, was cut over from magneto to automatic operation recently when Mayor RAY ROMICH (Left Photo) placed the first call while W. M. BUTSCHY, district manager at Cadiz, O., looked on. Right Photo: KEITH WAGNER (holding dial), the company's district plant supervisor, explained the operation of the new automatic equipment. A new central office building for Flushing, together with the automatic equipment, cable, telephones and wire plant cost $75,000, a portion of the company's $1,750,000 construction program now in progress. The company reports that its Laurelville, Leesburg, New Bremen and Williamsport exchanges are scheduled for conversion to automatic operation before the end of 1954.

THE PLANT MAN'S Notebook

by Ray Blain, Technical Editor

THE *Ohio Bell Magazine* reports that damage to underground cable by excavating machinery is becoming more common daily. In the northeast area of Ohio, they report 254 incidents of underground cable damage during the past four years. The southeast area has suffered 128 similar cases since 1952, and this damage is on the increase.

The reason the damage potentials are greater is easily understood. New housing, highways, industrial plants and public works continue rapid expansion throughout the country. At the same time, steady growth in communications has brought thousands of miles of new telephone routes into service.

These two factors greatly multiply the number of situations endangering telephone plant. Damage to a single coaxial cable might cut as many as 5,000 long distance circuits. Recent developments increasing the capacity of transmission carriers means that a single cable break today can have a much greater disruptive effect on service than at any time in the past.

While the cost of repairing a cable break may run into thousands of dollars, it is only minor when compared with the inconvenience to subscribers and the loss of revenue resulting from this interrupted service. The job of the telephone companies, naturally, is to make everyone aware of the dangers that lurk underground. The time-honored proverbial statement is as true today as ever—"An ounce of prevention is worth a pound of cure."

The responsibility of safeguarding underground plant is entirely the duty of telephone companies. Unless people are advised of its location before they dig, it is almost impossible to prevent damage. Many contractors have learned through experience that it pays to call "Repair Service" beforehand. It's those who are not aware of the consequence of digging blindly underground who must be reached.

Doing this is a job too huge for any small group to accomplish. It is a task for all to undertake. Many of the more obvious precautions are being taken by the Ohio Bell. Wherever possible, underground cable locations are being marked. Literature is being sent to all known contractors, and every means of publicizing the preventive maintenance program is being exploited. The objective, of course, is to urge everyone, employe and non-employe alike, to instinctively call "Repair Service" whenever he sees new excavations getting underway. Too many reports are far better than none at all. They may save a cable. It would seem that many of the Independent companies might care to consider the adoption of at least a part of this program with a view to providing better protection to their underground plant.

• • •

In the writer's home town of Falls Church, Va., the city council recently ordered candidates running for office to discontinue tacking their electioneering posters to utility poles. In our opinion, this is a fine idea because a tack in a pole may cause a lineman's spur to slip and contribute to a serious accident.

There was a time when poles were a favorite spot to tack advertising signs of all kinds. Metal signs were often nailed to poles and these presented a real hazard. In the old days, it was not uncommon for a pole to be so full of tacks that it proved extremely difficult to climb.

We had thought that the practice of tacking posters on poles had ceased for all time until they made their appearance in our village during the recent primary election.

• • •

It is very gratifying to note that some of the operating companies of the Bell System are now offering many special services and gadgets to customers, a practice that would have been frowned upon just a few years ago.

Colored telephones in eight solid colors and several two-tone combinations are now available. Then there is the cut-off switch, a handy button that allows the telephone user to silence the bell on one or more of his extensions. In addition, there is the privacy switch that when operated keeps anyone on an extension from listening in.

The use of outside extension bells is on the increase. They serve a real purpose when people have a large yard and spend considerable time outside during the summer months. Portable telephones equipped with a plug that can be connected to jacks at several locations in the house are by no means new, but their use is certainly on the increase. The hang-up handset telephone in the kitchen is now a real necessity in any home. Retractable cords also are gaining in popularity and use at a rapid rate.

While these simple devices cost very little they certainly make residence telephone service both more attractive and useful.

• • •

The Aircraft Industries Association reports that every combat soldier based in the United States could be moved coast-to-coast by America's domestically operated scheduled airlines in less than four days. This would involve the moving of almost 230,000 officers and men in infantry, airborne and armored divisions.

The above is certainly an astounding statement, but the commercial airlines today have 1,269 transports and 19 helicopters—an operating fleet equivalent to almost 35 Air Force heavy transport wings.

• • •

Despite the steady increase in dial central office installations since the end of World War II, the number of Bell System operators at work during 1953 averaged above 250,000—or more than in any previous year.

IN THE NATION'S CAPITAL

Concluded from page 21

ness bought control of Capital Transit. Thereafter, the company's conservative dividend policy was radically changed. Certain company financial reserves, accumulated by previous management, ostensibly for service improvements, were passed out to the shareholders. The District of Columbia Public Utilities Commission accused Wolfson of being too free with dividends thereby damaging the company's financial strength. Two dividend payments were temporarily held up by court order. Congressional critics said the new management was interested mainly in seizing control of the transit company in order to milk it dry and then dump the remains on the market, probably for government operation by default. While this may be harsh criticism, the Wolfson interests subsequently sold more than 100,000 shares in Capital Transit.

It is obvious that whatever may have been the good-will and objectives of the insurgent management, the streetcar and bus riders in the District of Columbia are not any better off today, with respect to the guarantee of good service in the future, than they were before the invading interests came.

In a competitive business, such as Montgomery Ward or any other non-regulated enterprise, the performance of management must meet the acid test of the market place. Either it delivers the goods or it falls by the wayside because it cannot meet the competition in price or quality of goods or service.

A utility company, on the other hand, has special obligations because it is not engaged in competitive business services. Alexander M. Beebee, president of the Rochester (N. Y.) Gas & Electric Corp., recently pointed out that a utility executive has three other responsibilities besides stockholders—customers, employes, and the community. If officers and directors overemphasize earnings and dividends to the detriment of service, they invite community censure and retaliation in the long run. This, in turn, can backfire to the detriment of the employe and the stockholder.

The lesson, therefore, for utility management to be gained from these sensational "raiding" operations we may hear about, from time to time, is simply this: Utility management has an obligation to keep the shareholders and employes, as well as the ratepayers and the community, informed about the company's duties as well as about its financial condition.

No intelligent shareholder would willingly jeopardize the good will and ultimate financial stability of a utility company by voting for any reckless promise to kill the golden goose. But the shareholder must have all the facts to make such an intelligent choice. The obligation works the other way—with respect to informing the ratepayer about the need for keeping the investor happy so as to insure a continued flow of necessary capital for service improvement and expansion. It is a delicate job, admittedly, maintaining this balance of intelligence in all quarters. Certainly it is not a job to be entrusted to amateurs or promoters or other parties who may well have an eye on something else besides serving the public.

Mobile Marine Service

On Sept. 8 the FCC handed down a decision in a contest between a telephone company and a non-utility radio station operator, contending for the right to render coastal telephone service to ships plying in and out of port, of Mobile, Ala. The decision was made by four members of the commission (Hyde, Sterling, and Hennock not participating).

The case arose when Mobile Marine Radio, an established coastal radio telegraph station applied for a Public Class III B coast station at Mobile, Ala., to provide telephone service to ships with suitable telephone equipment. This application was made in June, 1948. Six months later Southern Bell Telephone & Telegraph Co. applied for a similar permit.

The FCC opinion was decided more or less on the basis of established goodwill. Ship operators in the area apparently liked to do their business with the radio station. On the other hand, the commission found that the equipment proposed by Southern Bell would be somewhat better. On the balance, the commission decided to give the radio station the authority instead of giving it to Southern Bell.

This case is of passing interest simply as a precedent wherein the FCC preferred a non-utility company over a telephone company, in deciding between rival applications of this type. A collateral question about connecting calls with the land wire system of the telephone company was settled by agreement.

V V

Open 29th of Nationwide Toll Dialing Centers

Illinois Bell Telephone Co. on Sept. 8 placed in operation a new 13-million-dollar toll center equipped with the 4-A cross-bar switching system. This center connects with the nationwide operator toll dialing network.

Ultimately there will be 65 such toll centers covering this country and Canada, of which this latest is the 29th.

U.S. Had 51,340,000 Telephones In Service on June 30

The United States had a total of 51,340,000 telephones in service as of June 30, according to a statistical summary by American Telephone & Telegraph Co. This represents a gain of 967,000 telephones since Jan. 1.

The Bell System had 42,158,000, or 82 per cent of the total telephones in use as of June 30. This is a gain of a little more than 804,000 for the half-year.

Independent telephones numbered 9,182,000 or 18 per cent of the United States total.

AT&T said about 69 per cent of the nation's 46,500,000 households now have telephone service. The U.S. total represents a little more than 56 per cent of the world total of 90,600,000 telephones in use.

Average daily use of the telephone in this country continued to gain. For the three months ended June 30, daily telephone conversations averaged 194,400,000, up 8,100,000 a day from six months earlier.

V V

L. John Denney Heads Amherst (Va.) Company

L. John Denney, who gained 25 years of general telephone operating experience with International Telephone & Telegraph Corp., as of Sept. 1 took over ownership and the presidency of the Amherst (Va.) Telephone Co.

Mr. Denney says he plans a three-year construction program to provide service to presently unserved neighboring communities, and he foresees a potential growth of 350 stations. (At present the company has 710 stations.) He also plans the introduction of automatic ticketing on short-haul toll traffic, if this proves economically practicable.

V V

AT&T to Transmit Color TV To 95 Cities by End of 1954

American Telephone & Telegraph Co.'s Long Lines Department has announced it will be ready by the end of this year to transmit color television programs to about 95 cities where 187 stations get network service. About 125 of those stations are expected to be equipped for color broadcasting by that time, says Ralph L. Helmreich, Long Lines operations director.

Color TV is available now to 65 cities, and about 95 of the 145 network stations in those cities are getting color as well as black-and-white, the announcement said.

To prepare for color transmission, AT&T has had to re-engineer 31,000 of its 59,000 miles of TV channels.

California Interstate Elects Board Chairman and President

The election of Reid Gardner to the newly created position of chairman of the board and Willard Wade to the presidency was announced recently by Philip W. Thompson, secretary of California Interstate Telephone Co.

Mr. Gardner has been president of the company since its organization on

REID GARDNER

Jan. 21, 1954. He has resigned as president to become chairman of the board of directors.

Mr. Wade has been executive vice president of the company and a member of the board of directors. He also was elected a member of the board's executive committee to serve with Mr. Gardner and Donald Royce.

Mr. Wade holds a degree in business administration from the University of Colorado. He started to work as a student in 1930 with the California Electric Power Co. From 1932 to 1936 he was district manager in Elsinore. In 1936, he was appointed general superintendent of the Interstate Telegraph Co., a subsidiary of the power company. He was later appointed vice president and general manager, which position he held when the Interstate Telegraph Co. was sold to the California Interstate Telephone Co. in March of this year. He then became executive vice president of the new company, the position he held until his appointment as president.

Mr. Wade was recently elected president of the California Independent Telephone Association. This group represents 50 Independents in the state.

The California Interstate Telephone Co. is the third largest Independent in the state, having over 11,500 subscribers, and covering the territory from Lake Tahoe to Big Bear Lake.

WILLARD WADE

Mr. Wade lives in Bishop, which is the location of the company's operating headquarters. The general office is located at San Bernardino.

V V

General Telephone of Michigan Makes Two Appointments

L. H. Meyer, president of General Telephone Co. of Michigan, Muskegon, has announced the appointment of K. W. Benckert as operating vice president to succeed Everett C. Roys, who died recently after a prolonged illness.

Edmund C. Stoner, a veteran of 28 years of telephone experience, has been

K. W. BENCKERT

appointed chief engineer of the Michigan company to succeed Mr. Benckert.

Mr. Stoner, a graduate of Yale University, was employed from 1926 until this year by various subsidiaries of International Telephone & Telegraph Co. with the exception of 1948-51, when he served as a technical consultant to the Ministry of Communications of the government of Turkey. In this capacity he was charged with making fundamental plans for setting up the Turkish communications system along modern lines.

Other positions he held included traffic supervisor for the Chile Telephone Co.; equipment engineer, plant superintendent, chief engineer and general manager of the Peruvian Telephone Co.; chief engineer for Cuban Telephone Co.; chief engineer and member of the board of directors of the Spanish National Telephone System, and assistant vice president and division sales manager for the Federal Telephone & Radio Corp.

During World War II he served with the air force in the North African and Italian campaigns, attaining the rank of colonel. His decorations include the Order of the British Empire and the United States Bronze Star Medal.

Mr. Stoner went to Michigan after serving since 1951 as assistant to the president of Federal Telephone & Radio, where he directed research on new products and coordinated engineering activities on government contracts for electronic equipment.

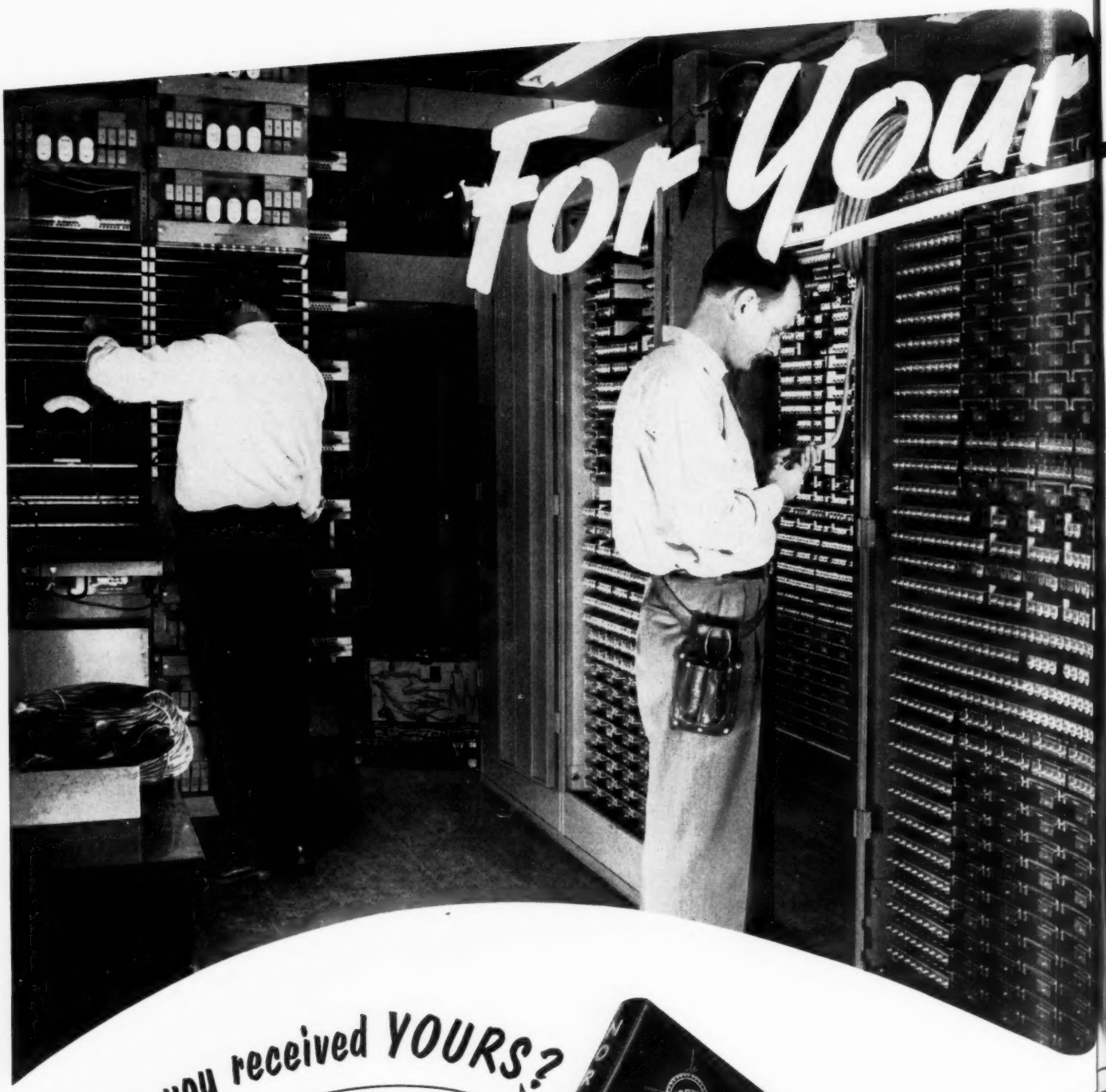
Mr. Benckert, chief engineer of the Michigan company since June, 1953, and vice president and chief engineer since July, 1953, has a background of 25 years of experience in the telephone industry.

He started his career in Easton, Pa., with the Lehigh Telephone Co. and when that company was absorbed by Bell Telephone Co. of Pennsylvania, remained with that system. He occupied various positions in the engineering and plant departments of the Bell company, and when he left in February, 1950, he was on the staff of the chief engineer at Harrisburg, Pa.

Prior to accepting the position of chief engineer of the Michigan company, he was chief of the engineering division of the Rural Electrification Administration (REA) at Washington, D. C. During World War II, he served as an officer in the Navy, supervising installation and maintenance of gyroscopic equipment and interior communication facilities.

V V

"America has its enemies of free enterprise. They are the people who now seek to convince the whole body of the public that we are on the verge of a depression. They would have us believe that business cannot be kept at a high level without high government spending for the materials of war."—THEODORE R. MCKELDIN, governor of Maryland.



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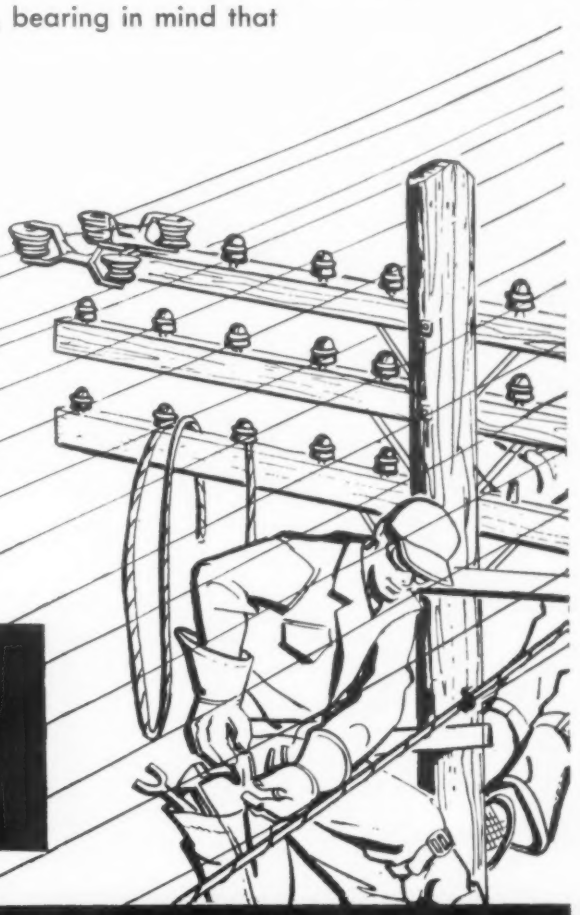

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You can be completely carefree about battery charging with Raytheon RectiChargeRs on the job. They go on year after year following the load automatically — maintaining constant voltage output over the entire load range — keeping batteries fully charged — prolonging battery life by preventing over or undercharging — and require routine inspection only once or twice a year.

Striking proof of dependability is shown in the results of tests made on a RectiChargeR after 15 years of continuous service. Engineers found it as good as ever — not the slightest impairment of electrical qualities — no mechanical deterioration whatever.

In fact there's no reason it couldn't go on for many more years giving the same trouble-free service.

Dependability counts heavily in the Telephone Industry — one reason why Raytheon RectiChargeRs are so widely used.

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MANUFACTURING COMPANY

EQUIPMENT SALES DIVISION

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RAYTHEON PRODUCTS INCLUDE: RectiChargeR* battery chargers; RectiFilteR* battery eliminators; Voltage stabilizers (regulators); Transformers; Tubes and other electronic equipment.

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Specify Raytheon RectiChargeRs and RectiFilteRs for completely dependable Telephone service. Your supplier offers a complete line for all requirements. Ask him for details or write direct.

Lincoln T&T Installs 50,000th Telephone—Up 100% Since 1936

The 50,000th telephone for Lincoln, Neb., was installed on Aug. 12. Lincoln is the largest exchange of The Lincoln Telephone & Telegraph Co. (LT&T) and is the general office headquarters for the company. The estimated population of Lincoln's urban area is 111,000.

The 50,000th telephone instrument bore a suitable inscription on a silver plate. Attending the ceremony were Merle M. Hale, vice president; K. L. Lawson, general commercial superintendent; A. B. Waters, district commercial manager; A. B. Gorman, advertising manager; Joe Hartley, editor of the *Lincoln Telephone News;* Richard H. Larson, member of the Nebraska Railway Commission; Lincoln's mayor, and the president of the Lincoln Chamber of Commerce.

The number of telephones in Lincoln has doubled since 1936, and 10,000 telephones have been added in the last five years. Lincoln serves 43 per cent of LT&T's telephones and handles 3,000 long distance calls and 286,000 local calls in an average day. This is an increase of 55 per cent in both local and long distance calls since 1944.

V V

REA Needs Telephone Engineers In Washington and Elsewhere

The REA announced on Sept. 1 that it has made 461 loans to Independent telephone companies and cooperative associations in 42 states and Alaska. To date, $186,446,542 has been allocated to these borrowers for the rehabilitation and expansion of present systems, construction of new lines to serve additional subscribers, and to provide modern dial service.

In carrying out this program, the REA announces it is still in need of qualified telephone engineers experienced in the design and construction of inside or outside telephone plant. Beginning salary is $5,940 a year. A few opportunities exist for specialists at $7,040 and $8,360 a year. Most positions are located in Washington, D. C., but a few are at various field locations. Applications for employment are being accepted by Henry C. Starns, chief, personnel division, Rural Electrification Administration, Dept. of Agriculture, Washington 25, D. C.

V V

Oregon Company Incorporates

Umpqua Telephone Co., Inc., with headquarters at Elkton, filed articles in the Oregon Corporation Department on Aug. 26. Incorporators include C. J. Licklider, Ruth L. Licklider and Warren E. Baker.

New *Airlight* **Outdoor Telephone Booth**—Larger, well-lighted and comfortable. Designed for use in all kinds of weather.

There's Something New in Telephone Booths

Any time you see one of these new *Airlight* Outdoor Telephone Booths you're likely to want to go right in and make a call.

For they are mighty attractive and comfortable. They are well-lighted, day and night. Tip-up directories are in easy reach. There's an ample shelf for packages and handbags.

The *Airlight* Outdoor Booths are never closed. They are available for service 24 hours a day, every day in the year.

It's just another step in the never-ending job of making the telephone more convenient and more useful to more and more people.

By bringing the telephone closer to you, we bring you closer to everybody. And thus make the service just that much more valuable.

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Reminding you that someone, somewhere, would enjoy hearing your voice today.

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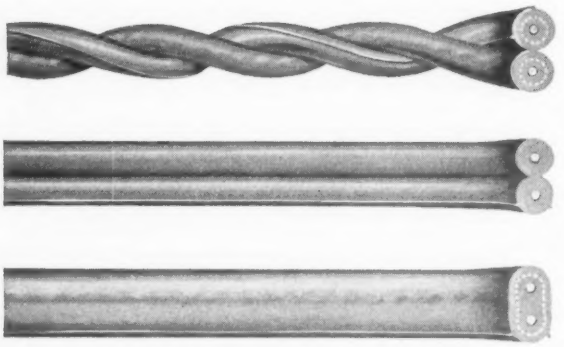

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Habirshaw insulation
for reliability.

Neoprene sheath
for high resistance to abrasion and weathering.

* * *

A complete line of telephone wire distributed exclusively by Stromberg-Carlson

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General Telephone Acquires Pennsylvania Independent

General Telephone Corp. has acquired all of the assets of the Vandergrift (Pa.) Land & Improvement Co., which includes primarily all of the capital stock of the Vandergrift Telephone Co., it was announced on Sept. 2 by Donald C. Power, president of General Telephone Corp.

The Vandergrift Telephone Co. currently serves more than 7,500 telephones. Exchanges in addition to Vandergrift, are located at Avonmore and Saltsburg, both in Pennsylvania.

Mr. Power went on to state that it is anticipated the Vandergrift Telephone Co. will be merged ultimately with General Telephone Co. of Pennsylvania, Erie.

TELEPHONE ACCOUNTING

Continued from page 19

used to record the month's charges in the work in progress ledger sheet.

Job Costs Summarized. When a job has been completed the costs are "worked up" to accomplish the following objectives:

(a) Transfer appropriate amounts from work in progress to their final accounts.

(b) To report to management the actual costs of construction in relation to estimates or more correctly in relation to the expenditures authorized.

(c) To develop the costs of the various units of property placed.

The Job Summary Form *(Fig. 3)* is used to record, in the left hand portion, the costs by account (by classification of plant). The individual summary sheets, such as those described in step "b" under Work in Progress Ledger above, are pulled from the file to obtain the distribution by account of the various direct cost elements charged to the job. The Work in Progress Ledger serves as the control for these direct cost elements and as a source of entry for total general overhead loading, interest during construction, and other costs allocated to the job; these latter costs must be prorated by account.

The right hand portion of the Job Summary Form *(Fig. 3)* is used to obtain a further breakdown of costs by units placed. A rather unique system is used for this operation which involves a proration of the actual costs of the plant classification over the units placed in accordance with the broad gauge or engineering standard costs established for the various units. This eliminates separate field and office accounting by units of property and

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A southern telephone company is well pleased with the way Ankoseal came through an ordeal of lightning and bullets. There was plenty of lightning during the summer of 1953. Many direct strikes, but in no case were the Ankoseal cable lines damaged. The only repair job was removing eight shotgun pellets from the jacket of a cable which was done "quickly and easily".

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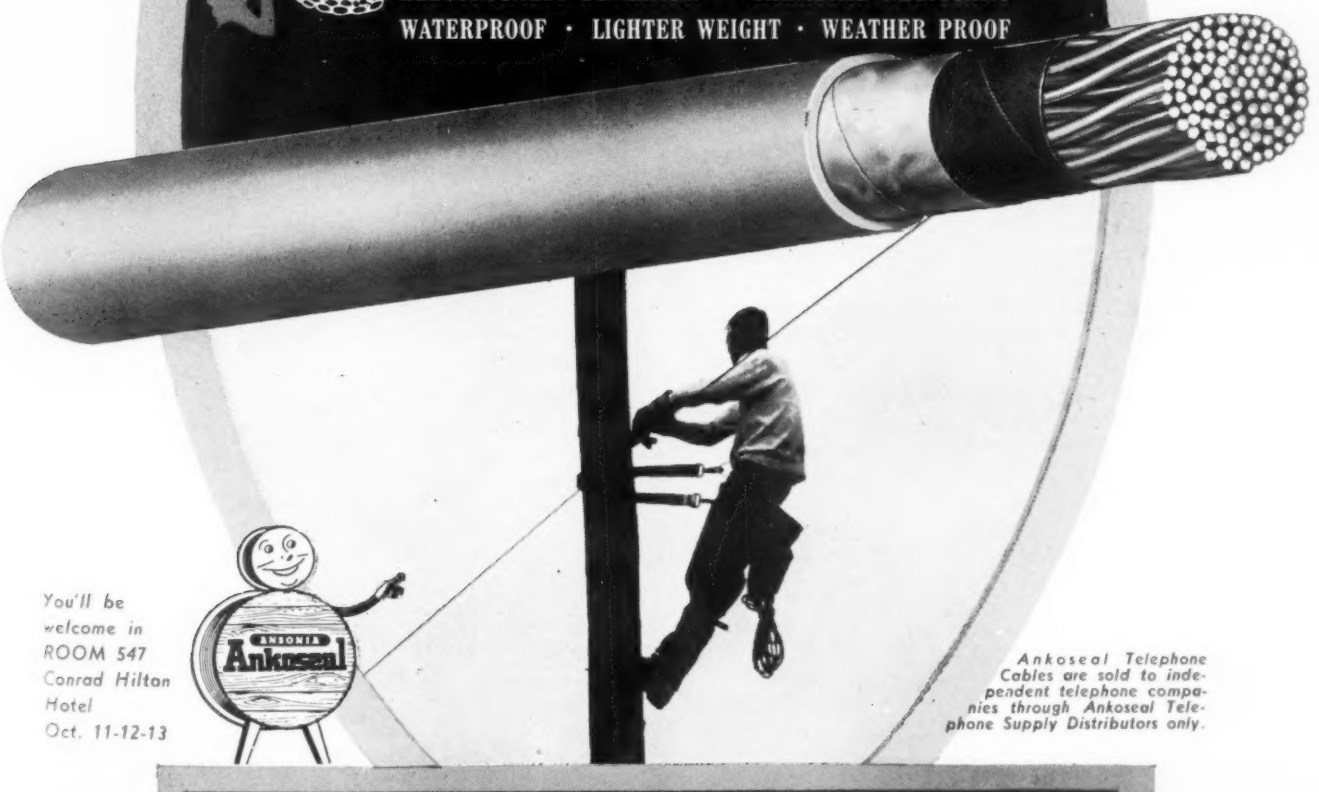

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Ankoseal Telephone Cables are sold to independent telephone companies through Ankoseal Telephone Supply Distributors only.

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gives us results which are very satisfactory. A simplified example would be the placement of 10 poles and four cross-arms. These all fall in the same plant classification account number 241 so our cost accounting routine provides us only with the total cost of $604. This is worked out in *Fig. 3* by extending the actual quantity placed by the broad gauge *unit* cost to get the broad gauge total cost. The actual total cost of all units placed is then prorated over the item "broad gauge total costs" to allocate the true charges to the various units of property, as follows:

A *Description*	B *Actual Quantity Placed*	C *Unit Cost Broad Gauge*	D *Broad Gauge Total Cost*		E *Actual Total Cost Prorated by Units*	
25′ Poles	3	47.00	141.00		154.00	(3)
30′ Poles	7	52.00	364.00		397.57	(3)
Crossarms 12 Pin.....	4	12.00	48.00		52.43	(3)
TOTAL	XX	XXX	553.00	(1)	604.00	(2)

(1) total per computation
(2) actual total costs for account 241
(3) column D x (2)/(1)

Billing Jobs Present Special Problems

The accounting system employed in the Hawaiian Telephone Co. is designed to handle the company's major cost accounting problems, namely the accumulation and reporting of job costs with further breakdown by plant classification and individual units. This is a phase of cost accounting which differs most from the problems faced by other industrial accountants. Some of the more typical costing problems are also faced by this company, however, and their solution presents special problems in a system geared to fixed asset accounting.

A telephone company is called upon to bill others for many types of plant construction and repair work. One type covers the sale of an interest or interests in utility poles. Rather than crowd the streets with separate poles for each utility, the interested parties in Honolulu have formed a joint pole committee and agreed to the joint ownership of utility poles which are used by all parties. A typical example would be a 40-foot pole which would be owned by Hawaiian Telephone Co. (29 per cent), Hawaiian Electric Co. (29 per cent), Honolulu Rapid Transit for electric bus lines (29 per cent) and city and county of Honolulu (13 per cent) for street lighting. It would be an unnecessary burden to keep costs on all of these transactions so the participating companies meet annually to establish standard costs based on the prior year's experience. These standard costs are used for acquisition or sale of interests.

Another frequent example of billing jobs arises from accidental damage to poles and related communication facilities. When an automobile knocks down a utility pole, the driver or owner is responsible for all costs incident to the replacement of the pole, transfer of cable or wire and the provision of emergency communication service while replacement and repair work is in progress. This normally involves an insurance claim, and billing procedures must therefore conform with the requirements of insurance companies. A credit must be given for the expired life of the broken pole or equipment.

From time to time, certain real estate development companies wish to install special communication facilities in a new sub-division. These special facilities might be underground distribution cables in an area normally served by aerial wire or cable. We charge these subdividers for the difference between the cost of special facilities and the normal cost of building plant to serve the new area. These are "aid to construction jobs" which must be billed upon completion. The money received is credited to the plant accounts concerned thus reducing the telephone company's investment in the new facilities.

The last significant category of billing jobs involves what we term "custom work." This usually covers repair and maintenance work performed by the telephone company on communications facilities which are privately owned by others.

The special cost accounting problem presented by billing jobs arises from the fact that we must bill for services rendered as soon as the work is completed. Average hourly rates for the different labor groups and classes of vehicles are not determined until the month's business is closed. Supply and tool expense rates and engineering rates as well as other overhead rates are likewise not known until the end of the month since all rates are designed to distribute the entire month's cost. In order to bill a job that is completed, for example, on the second of the month, we must apply average rates for prior months to actual hours

Construction m
and
WITH THE DOUBLE GU
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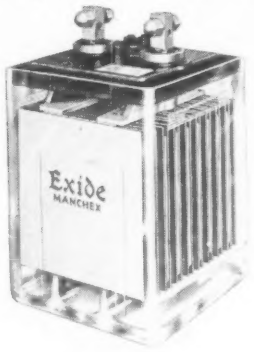
LEADING MA

Exide-Manchex
telephone batteries



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provide extra conductivity for sustained vo
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rubber along with slotted plastic separato
are impervious to chemical and electrical
actions . . . plastic spacers assure plate alig
ment . . . for assured dependability, long l
and low-cost maintenance use Exide Manch

The Electric Storage Battery C
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1888 . . . Dependable Batteries
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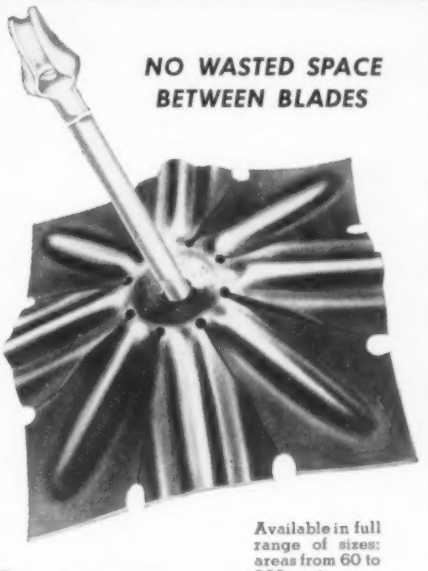
Use ALL the anchorage area with CHANCE 8-Way Expanding Anchors



The Chance 8-Way has eight blades, instead of the usual 2 or 4, that expand to form a square convex-shaped anchor with up to 63% of its area in undisturbed earth. This convex shape holds like a wedge.

The load is evenly distributed over all 8 blades all the way around the anchor with each blade carrying only one-eighth of the total load and the base plate supporting each blade. Heavy ribs also reinforce the blades.

The Chance 8-Way expands quickly, too; requiring 3 to 9 fewer blows than other expanding anchors under comparable conditions.

You buy with confidence when you buy a CHANCE.

Available in full range of sizes: areas from 60 to 200 sq. in.

Made by A. B. Chance Company

the new **cane** *seat is cooler - cleaner - more comfortable...*

sturgis SC-240

Literally "by request"—this new operator's chair retains all the posture advantages for which Sturgis is famed and adds the cool, clean comfort of a *cane* seat. The posture-curved, well-cushioned back rest is covered in genuine leather.

The exclusive Sturgis "Follow-Flex" feature automatically adjusts to the operator's every movement, supports her restfully all the time, discourages fatigue, keeps her at top efficiency.

Other new and welcome features include a plastic-coated steel foot ring which retains its color and a handy purse holder, available on request. Six seat heights, all adjustable.

Mfd. by Cook Electric Co.

something new in sub-station protectors

The Cook type RO-9u Sub-station protector has a rugged all-metal housing in which are mounted the A-9u 7 amp. fuses and the line and surge arresters.

This protector meets all requirements of the Underwriters' specifications and is listed by the Underwriters' Laboratories.

Insulation is of high impact bakelite, and secondary surge arresters furnish high voltage protection when fuses are blown or removed.

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in the current month. The job then must be "worked up again" after actual rates are known and the difference between billed cost and actual costs allocated to profit and loss or other accounts at that time.

Summary

Telephone utilities do not manufacture a product for sale. They do have cost accounting problems, however, which require a system designed to provide us with job and unit cost data for telephone plant construction. Unit cost information is vital to proper fixed asset accounting particularly for purposes of making accurate retirements from plant in service.

One of the most important accounting techniques is the use of the average labor rate, the average trucking rate and others which distribute all costs incurred during the month over the work performed in the monthly ac counting period. This procedure permits considerable clerical cost reduction and adequately serves the principle purpose for which this system was designed. It does sacrifice efficiency in the relatively smaller number of cases where job costs must be worked up for billing purposes before the close of the month.

Another technique which might well have applicability outside of the telephone industry is the use of engineering standard cost (known variously as test unit costs or broad gauge unit costs) to distribute the actual cost of a particular class of plant over the various different units which make up the total class.

V V

Nebraska Independent Pioneers Sponsor Fishing Party

The semi-annual fishing party sponsored by the Frank H. Woods Chapter of the Independent Telephone Pioneer Association was held at Seward, Neb., on Aug. 28. Sixty Pioneers from Nebraska attended. The afternoon was spent playing golf, fishing and reminiscing. This was followed by steak dinners, an evening of cards and more reminiscing.

The committee in charge of arrangements consisted of Claude Helm (chairman), Ray Baldwin, R. H. Gray and Ed Imig.

V V

Dial Telephones To Be Used To Start Diesel Engines

Dial a number and start a diesel locomotive engine — certain employes of the Pittsburgh & Lake Erie Railroad soon will be doing just that. The road has developed a telephone system that lets a man at a central control point dial code numbers to start or stop the engines in diesel locomotives parked on tracks miles away.

Use of the new setup, the Pittsburgh & Lake Erie believes, will help prevent freezing and overheating and will serve to detect vandalism on diesels sitting unattended and out of service at remote points.

The system has been approved for installation on the P. & L. E., an affiliate of the New York Central. It works like this:

A wayside relay box or plug-in station is set up beside each track where engines are to be left when out of service. A cable is run from the station to a receptacle on each locomotive. Relays from the plug-in station enable the engine to start or stop.

V V

"When, in a period of economic readjustment, someone asks: 'How's business?' an authentic answer would be: 'Business is better for the wide awake than for the sleepy.' "—M. S. Rukeyser, columnist, New York *Journal-American*.

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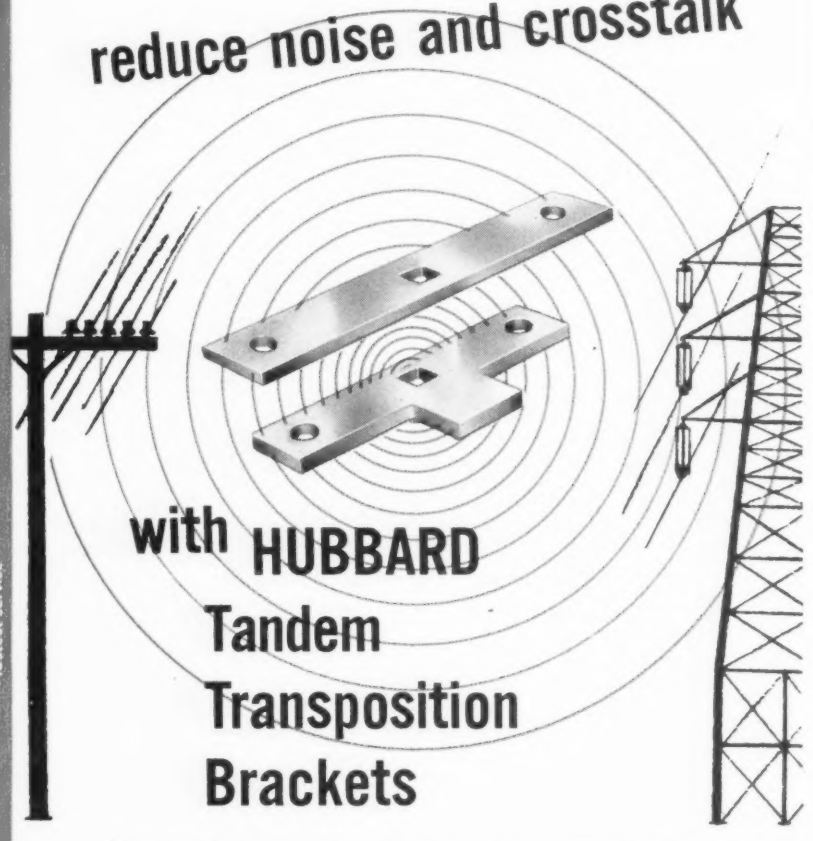

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You need fear no interference when your telephone lines are transposed with Hubbard Tandem Brackets. Engineered to strict telephone requirements, these brackets provide the proper base for a good transposition scheme. Two types are offered—straight and offset (used on corners to withstand the greater pull of wire). Order Hubbard Tandem Brackets from Automatic Electric today. Shipped immediately from stock.

Cat. No. S-3163-T	*straight bracket*	each:	$ .55
S-3164-T	*offset bracket*		.89

Prices are F.O.B. Chicago and are subject to change without notice.

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The 1954 Convention of

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Celebrating 57 Years of Service to the Independent Telephone Industry

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A Cordial Invitation Is Extended to All
INDEPENDENT OPERATING TELEPHONE PEOPLE
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GENERAL SESSIONS	CONFERENCES
Topics of Outstanding Importance Excellently Qualified Speakers	Plant-Traffic-Commercial-Accounting Answers to Tomorrow's Questions

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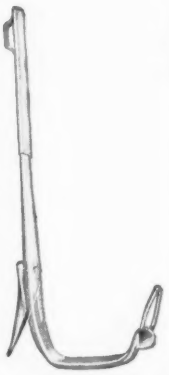
SAFE ON THE JOB

Another First

One piece aluminum sleeve adjusts from 15″ to 18″ in multiples of ¼″. Locked in place with standard steel screws.

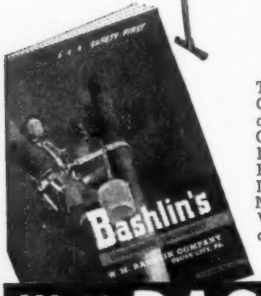
Comfort on the job, lightness and safety combine in Bashlin's adjustable Climber with removable gaff . . . Forged of aluminum alloy, the Bashlin Climber is lighter than conventional climbers and the *Same Strength* as *Equivalent Steel*. It's form fitting and has all the original Bashlin features.



Removable gaff forged from alloy steel, features triple locking device with standard self-locking tested steel screws

HOT LINE TOOL FACTORY DEMONSTRATORS

Men who think first of safety and efficiency on the job — use Bashlin Equipment.



The new Bashlin Catalog gives full details on the Complete Bashlin Line of Safety Equipment for Linemen and Maintenance men. Write for your copy.

W.M. BASHLIN COMPANY
GROVE CITY 1, PA.

The three centers of interest General Telephone Co. of Illinois used in attracting nearly 20,000 people to its display at the recent Illinois State Fair.

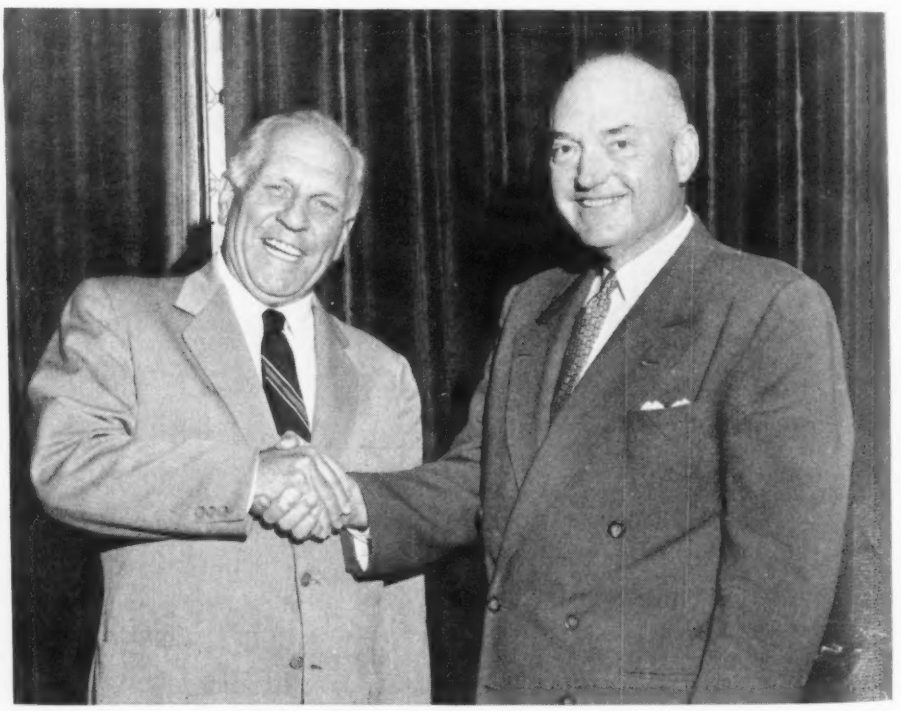
General of Illinois Describes State Fair Exhibit

General Telephone Co. of Illinois, Springfield, sponsored an exhibit at the Illinois State Fair during Aug. 13-22, inclusive. The objectives to be accomplished were to inform the public about General Telephone System, General Telephone Co. of Illinois and Independent telephony generally.

A description of the company's display may be of interest and help to other telephone companies planning such exhibits.

It was decided by the General Telephone Co. of Illinois that three main centers of attraction would be constructed to help maintain interest and to stimulate attendance at its booth space, as follows:

(1) A 4-foot x 8-foot map of Illinois was constructed with each of 235 exchanges indicated by a small colored lamp and a name tag. A large General



California Governor GOODWIN J. KNIGHT (left) congratulates EDWIN M. BLAKESLEE, president of General Telephone Co. of California, Santa Monica, on the company's 25th anniversary, observed on Sept. 1. To celebrate its silver anniversary, the following public relations program was set in motion: An extensive advertising campaign; the preparation and delivery of press kits to each newspaper with stories covering local telephone history, biographies of local managers and other general news; a series of customer and employe open houses, at each of which a 16-page booklet, "The General Telephone Story," was handed out (these were also mailed to civic dignitaries and others influencing public opinion), and a September scheduling of company speakers before as many service clubs throughout its territory as possible.

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Rely on the Ray-O-Vac Telephone cell for superior telephone performance. Ray-O-Vac has perfected a specially compounded mix for telephone service which means lower cost per hour of tele- phone service. Available in either screw or clip terminals.

Ray-O-Vac LEAK PROOF Brand Flashlight batteries are fully **sealed in steel!** Only these flashlight batteries are fully sealed in steel . . . top, bottom, and sides. This all-around steel casing makes Ray-O-Vac flashlight batteries keep their power longer. Ray-O-Vac LEAK PROOF Brand is guaranteed against corroding your flashlights.

Ray-O-Vac Company, Madison 10, Wisconsin
Ray-O-Vac Canada Ltd., Winnipeg, Manitoba

Telephone Co. of Illinois sign was mounted on top of the display and also the message "We Serve These 235 Exchanges—Spot Your Home Town." The lights were wired in groups to flash on and off so that spectators could grasp the company's coverage of the state. The background was colored gray and the map proper was yellow, which with six different groups of colored lights attracted attention.

(2) A 4-foot x 8-foot quiz board was the second display; also with a gray background, and with the new General Telephone System symbol mounted at the top. Questions were printed on yellow offset plaques, similar in design to the system symbol; directly below the question was a blank glass-covered space which lighted up with the answer when the adjoining button was pressed. Questions and answers were:

Q. How many Independent telephone companies in Illinois?

A. 360.

Q. How many people use General telephones in Illinois?

A. Over ½ million.

Q. General Telephone System operates in how many states?

A. 21 states coast to coast.

Q. General operates in how many of the 102 Illinois counties?

A. 75.

Q. How much did General spend in 1953?

A. Over 15 million dollars.

Q. How much geographical area does the Independent industry serve in U.S.A.?

A. Over ⅔.

Q. How many telephones can you call in U.S.A.?

A. Over 50 million.

At the bottom of the display, a permanent sign was placed reading, "Question: What is today's biggest bargain? Answer: Local and Long Distance Telephone Service."

(3) Another center of attraction was a multi-colored pin wheel mounted on a 4-foot x 8-foot display having the new General Telephone System symbol at the top with the message "Free—Win A Telephone Call To Your Home Town Served By General." Below the wheel, and in groups of 16, all of the 235 General exchanges were arranged alphabetically under 16 numbers. Spectators were invited to identify their home towns, spin the wheel, and if it stopped in the correct number space they received a free telephone call to their home town served by General Telephone Co. of Illinois. The clicking of the heavy plastic needle against the mounted nails and the motion of the 6 colors used in the various sections of the wheel attracted a great deal of attention and usually stopped the passing traffic.

The booth was manned by both male and female employes of the company.

As visitors stopped at the display, one of the attendants on duty explained some of the basic statistics and facts about the General company of Illinois, the General Telephone System or about the Independent telephone industry. If he was a General Telephone subscriber, or if he had friends or relatives in one of the company's exchanges, he was invited to spin the wheel in an attempt to win a free telephone call. A library of current directories assisted in determining the correct telephone number. A telephone was installed by Illinois Bell Telephone Co. at the General booth, so calls were made immediately when there was a winner.

There was a total of 155 winners during the 10 days, but only 104 telephone calls were completed, mostly due to the fact that the called parties were not at home.

The total attendance at General's booth was estimated to be between 19,000 and 20,000; a hand meter was used to click the visitors who stopped at the company's space, but frequently it was difficult to accurately count the exact number of people present. Total attendance was estimated to be 1,005,000 by fair officials.

Of the people talked with, it was estimated that 35 per cent were General Telephone Co. of Illinois subscribers, 40 per cent were Bell subscribers and 25 per cent were subscribers of other Independent telephone companies.

V V

Tulsa Information Operator Saves Life, Gets Vail Award

A Vail citation, given to telephone industry employes for achievement above and beyond the call of duty, went to Mrs. Beverly Johnson, of Tulsa, Okla., recently.

Mrs. Johnson received the award for saving the life of Dr. W. G. Choate by locating a doctor for him. Dr. Choate, an advanced diabetic patient and ill at the time with influenza, had fallen, suffering a compound fracture of the hip. When found, he had been lying on the floor for several hours, had developed pneumonia and was in a state of shock. His wife, also ill with influenza, had dialed a dozen doctors without success. Her final desperate appeal to "information" brought a doctor within 20 minutes, thanks to the quick action of the operator.

V V

Housewives Dial for Shopping News in Unique Chicago Service

Chicago housewives, before starting on a shopping tour, may now dial a telephone number and hear by tape recording "the top six bargains of the day," in the same manner in which they telephone to get the weather and time signals.

The introduction of automation to bargain hunting is the brain child of Robert W. Ward, for 10 years a sales manager for radio station WJJD, who quit his job to start "Bargain Shopping Services, Inc." This service, with a 50-telephone trunkline, now averages more than 1,000 calls a day from shoppers interested in getting the latest tips on price reductions.

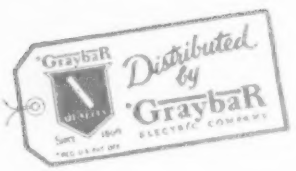
"We never list an item in our six best bargains of the day unless it is a 'special' that has been cut drastically from regular prices," Mr. Ward says.

Stores pay a penny an incoming call, plus $5.00 a day recording charge, for a listing on Mr. Ward's tape recorded message. Illinois Bell Telephone Co. has a special meter on Mr. Ward's trunkline device which records the number of incoming calls every day. The recorded message is changed daily. At 3 p.m. the next day's message starts.

The service has about 40 regular advertisers, some of whom list their wares twice a week, while others, mainly food stores are "on the tele-

Type S-1-A
Frequency Modulated
Subscriber Carrier

We are as proud of this tag



As we are of our carrier!

NOW SHIPPING!
$1180. per Channel

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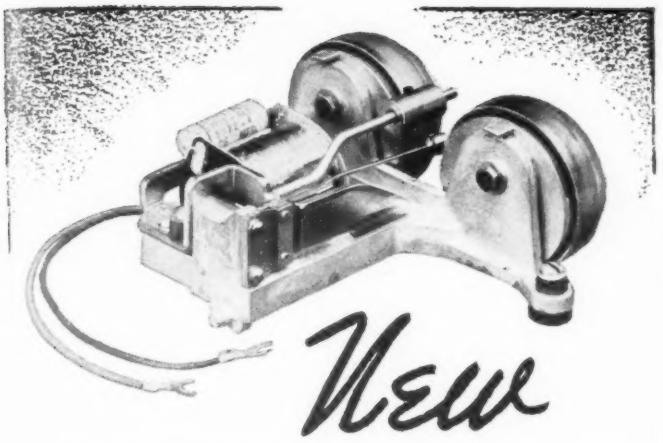

New

HIGH IMPEDANCE RINGER GIVES OPERATING ECONOMY

For harmonic, synchromonic and decimonic frequencies

This new USI engineering approach contains all the outstanding basic features of the new Western Electric type C straight line ringer while making available equally superior multi-frequency ringers. USI ringers are especially designed for use in the new W.E. No. 591 sets to provide selective ringing in five frequencies in harmonic, decimonic or synchromonic series.

Economy: Since USI ringers are designed to operate on low currents with high impedances of approximately 100,000 Ohms at 400 cycles and 400,000 Ohms at 1000 cycles, many operating economies are possible. As many as ten ringers may be bridged on a single line. Costly trouble shooting, especially of marginal lines is reduced considerably.

Resonant Frequency is obtained by a new principle using a small clapper on a flexible arm to strike the gongs and a separate resonant weight on a vibrating arm to maintain resonance. This design, together with rugged construction, reduces maintenance costs to a minimum.

OTHER FEATURES . . .

Stability of USI ringers during a long life — 200 hours continuous ringing.

Improved Ringing Tone of the new W.E. 500 type sets is maintained. A volume control operated by the subscriber is available if desired. Each ringer is a completely self-contained unit designed and constructed to perform in W.E. 591 sets without making any changes in the set itself. All ringers are completely adjusted at the factory to ring at the designated frequency. Only a screwdriver is needed to install the ringer in the W.E. 591 sets.

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Ask for ringer folder.
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Across the nation Kennecott Cable helps make telephone service more reliable.

Every time you see the Kennecott name on a cable reel you can be sure that the cable has been tested and re-tested for accuracy in manufacture and performance.

Quality control from raw material to finished cable assures you that you can always count on Kennecott for fine cable.

Call your nearest Chase sales office for complete information.

CHASE BRASS & COPPER CO.

Waterbury 20, Conn.

DISTRIBUTOR FOR

KENNECOTT WIRE & CABLE CO.

Subsidiaries of Kennecott Copper Corporation

CHASE WAREHOUSES and OFFICES:

Albany†	Chicago	Denver†	Kansas City, Mo.	New York	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	Philadelphia	Seattle
Baltimore	Cleveland	Houston	Milwaukee	Pittsburgh	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Providence	
			Newark	Rochester†	(†sales
			New Orleans	St. Louis	office only)

PERMACRETE
Sectional Concrete
TELEPHONE BOOTHS

Precast concrete, steel reinforced, sectional concrete Telephone Booth — 3′ x 3′ x 7′ high inside clear dimensions. Made and shipped in 6 pieces; 4 walls (1 with door cast in) — one-piece roof and floor — complete with window, instrument mounting panel and shelf. Shipped knocked down — weight 3000# each.

3′ x 3′ x 7′

This maintenance free concrete Booth provides adequate protection from weather and fire; can be installed in the field in approximately 4 hours.

Write for Bulletin CB-1

PERMACRETE PRODUCTS CORPORATION
COLUMBUS 7, OHIO

Houses Foundations Markers

NONE BETTER

...For use wherever ALL-FLAX cord is required.

THE LINEN THREAD CO., INC.
418 Grand St., Paterson 1, N. J.
New York 17
Boston 10 • Chicago 10 • San Francisco 5
Baltimore 3 • Gloucester

phone" daily. In case of a jam-up with more than six companies seeking time on any one day, the firm that has been advertising longest or most consistently gets the space.

V V

Stromberg Names R. W. Pouk Jr. Chicago Office Manager

Ralph W. Pouk Jr. has been appointed office and supply manager of the Chicago branch of the Stromberg-Carlson telephone division, as announced by T. C. Thompson, sales manager of the telephone division.

Mr. Pouk was born in Chicago and after receiving his early education in

R. W. POUK Jr.

Fort Worth, Tex., returned to the Chicago area and completed his schooling, which included attendance at Northwestern University. He joined Stromberg-Carlson in 1946 in the capacity of stock record clerk, advancing to the positions of order editor and acting office and supply manager.

Before joining Stromberg he was a member of the U. S. Air Force during which time he was stationed in England for two years. Previous business experience includes part time work with the City News Bureau of Chicago and Armour & Co.

V V

Kellogg Appoints Rundle, Mohr Field Representatives

O. C. Bailey, assistant sales manager of Kellogg Switchboard & Supply Co., a division of International Telephone & Telegraph Corp., has announced the appointments of F. A. Rundle and K. W. Mohr as field representatives.

Mr. Rundle has been assigned to the Kellogg company's western division under E. R. Sears, division manager. He will represent Kellogg in Washington, Idaho and western Montana, with headquarters temporarily in Portland, Ore. Prior to joining Kellogg, Mr. Rundle was associated with the Western Electric and General Motors corporations in sales and management.

F. A. RUNDLE

K. W. MOHR

Mr. Mohr, former general manager of the Monroe County Telephone Co. of Sparta, Wis., has been assigned to the Chicago division under C. F. Cheney, division manager. His headquarters are in Sparta. Mr. Mohr has been associated with the Independent telephone industry in various capacities for over 26 years.

V V

"Three factors undergird a confident faith for these critical times—the productive might of the Western world, the high degree of liberty and individual dignity which exists on this side of the Iron Curtain, and the great resurgence of religious faith." — J. Backstrand, president, Armstrong Cork Co.

READY TO WIRE IN-

The New Cook 26 PAIR Stranterm

352-1226

STRAND MOUNTED WITH PATENTED OPTIONAL PROTECTION*

Like its predecessor the 11 and 16 pair Stranterm, the new 26 pair strand mounted cable terminal with its exclusive double door (13 pairs on either side) enables the installer to work close to the pole. All terminals are supplied with 3½ foot, 24 gauge lead or plastic cable stubs which are soldered to heavy studs imbedded in a special unsaturated Polyester thermal setting plastic.

The quick opening cover lock and weatherproof cover design, coupled with the embossed Minigap snap-in sockets, spring bronze ground strip, and the neoprene self adhering drop wire entrance seal, evidence the result of Cook Research and Development as applied to telephone apparatus.

MINIGAP
Push Button Protection

ACTUAL SIZE
41-290

*Stranterms are the only Strand Mounted Terminals which permit the installer to apply protection to the pairs requiring dischargers, or to install the same terminal unprotected.

COOK ELECTRIC Company
Since 1897

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